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A MONTHLY JOURNAL DEVOTED TO CLINICAL RADIOLOGY AND ALLIED SCIENCES

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No. 1

The Early Pneumoencephalographic Findings Following Penetrating Wounds of the Brain¹

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NEUROLOGICAL sequelae which are the result of penetrating wounds of the brain may call for pneumoencephalography at various periods after the initial injury. This report is based upon studies made upon patients during postoperative care while in the theater of operations. Roentgen examination was done, as a rule, in an attempt to assist in the diagnosis or localization of subdural hematomata or complicating brain abscesses when clinical studies alone were inconclusive. The purpose of this presentation is to record the degree and rapidity with which hydrodynamic effects are manifested in the ventricular system. Such observations may aid in the evaluation of the roentgen findings in later periods of convalescence, or in the explanation of late neurologic sequelae.

MATERIAL

The 23 pneumoencephalographic studies reported were made during the care of 256 patients with penetrating cranial wounds at the 36th General Hospital, in the European theater. Dural penetrations occurred in 206 of this group. The majority of the patients underwent primary operation in an American evacuation hospital.

The 256 patients are divided into two groups: (1) 146 with penetrating cranial wounds, of whom 119 showed dural penetration, observed during one phase of operation in the European theater; (2) 110 with cranial wounds, with 87 cases of dural penetration, who were studied during a second phase.

In the first group, routine roentgen studies revealed the presence of retained bone fragments within the brain after primary débridement in 11 per cent; of retained metallic fragments in 27 per cent. A survey showed that brain abscess was a complication in 33 or 16 per cent of the 206 patients with dural penetration.

The time at which the pneumoencephalograms were made varied from fourteen to ninety days after the original injury, which corresponds essentially with the date of primary débridement. Several patients had studies made after secondary surgery. Two had evacuations of brain abscesses prior to encephalography. The lesions in the patients upon whom the studies were carried out represented a fairly good cross section of the general type and severity of injuries, as well as complications, encountered in the whole group of 256 patients.

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TABLE I

Case Number	Date of Primary Débridement	Tissue Loss	Bone Defect		Bone Fragments	Metallic F.B. Size in mm.	Interval (days)	Pressure Defect	Dilatation of Ventricles				Displacement	Sub-arachnoid Air Pattern		Remarks
			Size in cm.	Location					Right	Left	3d	4th		Right	Left	
1	1/30/44	++	7 × 7	Left parietal	3	0	37	↑	N	+	N	N	↑	0	0	3 cm. abscess, left (Fig. 1, A)
1	.....	++	.....	.....	..	.....	79	0	+	+	+	+	↓	0	0	Abscess débrided (Fig. 1, B)
2	2/5/44	++	5 × 5	Left parietal	0	0	30	↑	+	N	N	N	↑	0	0	Left temporal abscess
3	9/23/44	0	5 × 3.5	Right fronto-parietal	0	0	43	0	+	+	N	N	↓	+	+	Hygroma, right. Dura intact (Fig. 2)
4	2/1/44	++	13 × 6	Right fronto-parietal	1	0	77	0	+	+	N	N	↑	+	+	See Fig. 3
5	2/13/44	++	3.5 × 3.5	Left parietal	0	0	95	0	+	+	+	+	↑	0	0	Previous abscess (Fig. 4)
6	2/13/44	?	3 × 6	Frontal	0	7	21	0	+	+	+	+	↑	0	0	Bursting fracture (Fig. 5)
7	2/11/44	?	3 × 3	Left	0	0	61	0	+	+	N	N	↑	0	0	Bursting fracture (Fig. 6)
8	10/24/44	++	10 × 4	Right parietal	+	2 × 8	14	0	+	N	N	N	0	0	0	Early change (Fig. 7, A)
8	.....	.....	.....	.....	..	.....	71	0	+	N	N	N	0	0	0	Progressive dilatation (Fig. 7, B)
9	11/15/44	++	Large	Occipital	0	10 × 14	66	0	+	N	+	+	0	post	0	Suboccipital decompression (Fig. 8)
10	2/11/44	0	4 × 10	Left fronto-parietal	0	0	28	0	N	N	N	N	↑	0	0	Subdural hematoma (Fig. 9)
11	2/7/44	++	4 × 4	Left parietal	0	0	63	0	N	N	N	N	0	local	0	Previous left parietal abscess (Fig. 10)
12	1/29/44	++	7.5 × 7.5	Left parietal	2	0	64	0	+	+	+	+	↑	+	+	Dura intact
13	11/9/44	0	4 × 2.5	Left parietal	1	0	33	0	N	+	+	+	0	0	0	Sterile bone fragments
14	2/6/44	?	5 × 5	Right frontal	2	10	43	0	+	N	N	N	0	+	+	
15	1/18/44	+	2.5 × 4	Right temporal	0	0	90	0	N	+	N	N	0	N	N	
16	2/17/44	++	3 × 2	.....	0	0	46	0	N	+	N	N	0	+	+	
17	2/12/44	++	9 × 6	Left parietal	3	0	55	0	N	+	N	N	0	+	+	
18	9/25/44	.....	6 × 6	.....	0	0	30	0	N	+	N	N	↓	+	+	
19	11/17/44	++	3 × 3	Right parietal	0	0	21	0	N	+	N	N	0	+	+	
20	12/3/44	++	3 × 3	Left frontal	1	0	25	0	N	+	N	N	0	+	+	
21	12/4/44	++	3 × 6	Right fronto-parietal	3	4 × 10 6 × 11	26	0	N	+	N	N	0	+	+	

Key
 - decrease
 N normal
 0 absent
 + slight
 ++ moderate
 +++ marked
 ↑ right
 ↓ left
 ↑ superior
 ↓ inferior

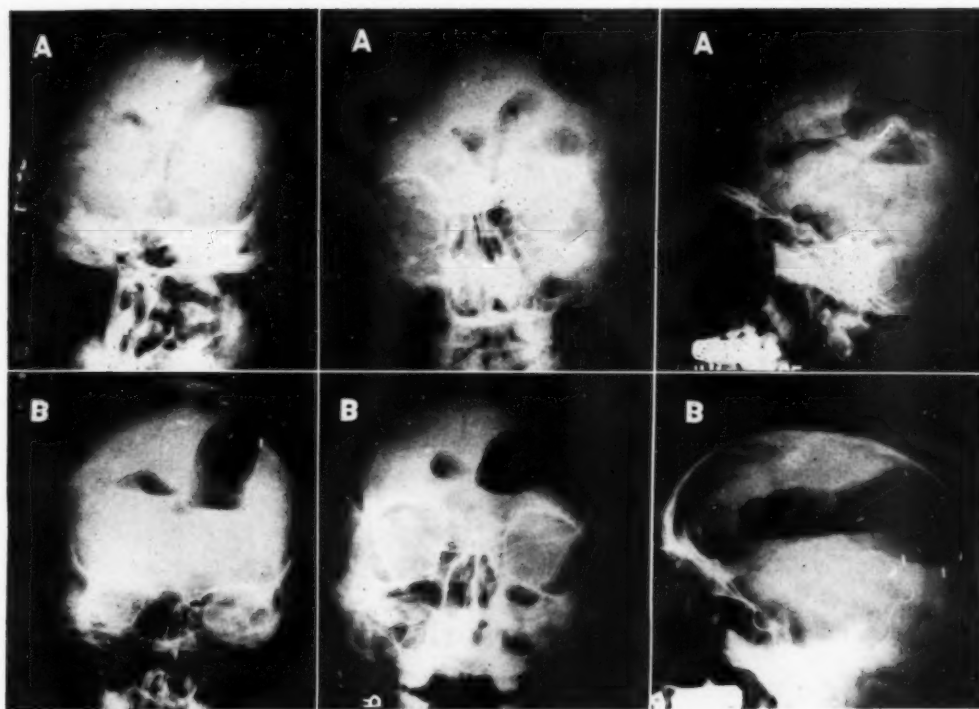


Fig. 1. Case 1: 37 and 79 days postoperative.

A. Thirty-seven days postoperative. Severe loss of cerebral tissue left side; bone defect 7 cm. in diameter; intracerebral bone fragment medial and superior to abscess cavity outlined by air; posterior horn of left lateral ventricle displaced superiorly and medially; loss of subarachnoid air shadow on left; subdural collection on right.

Diagnosis: Brain abscess with slight dilatation of left lateral ventricle. Arachnoiditis left.

B. Seventy-nine days postoperative (the brain abscess shown in A had been débrided). Marked increase in the size of the left lateral ventricle with elevation posteriorly; slight ipsilateral shift of the entire system on a compensatory basis. Slight enlargement of the right lateral, third, and fourth ventricles was also noted.

Diagnosis: Postoperative hydrodynamic compensation with ventricular dilatation, severe, and shift. Arachnoiditis generalized.

RESULTS

Table I is a summary of the pertinent data relative to the wounds and general surgical procedures, as well as the pneumoencephalographic findings. An attempt has been made to estimate the degree of loss of brain substance sustained at the primary débridements prior to encephalography. In some instances this was impossible due to lack of clarity in previous records. The size of the bone defect is noted, and the interval between injury and the pneumoencephalogram is recorded. The subarachnoid distribution of air is also indicated in the table.

Two cases of brain abscess were demonstrated. In one the abscess cavity itself

was outlined by the injected air (Case 1, Fig. 1). The second showed evidence of a mass lesion with local pressure defects. Two other instances of subdural collections were detected in the 23 examinations. In one of the two (Case 3, Fig. 2), trephination revealed a hygroma as localized.

Of the entire group, only 3 showed a normal subarachnoid air pattern. The remainder manifested either localized or generalized obliteration of air shadows.

In Cases 4 and 5 the roentgen studies were made after evacuation of an abscess, thus representing considerable brain tissue loss due to the two operative procedures, the primary débridement and the débridement of the abscess. Figures 3 and 4 present the ventricular patterns at postopera-

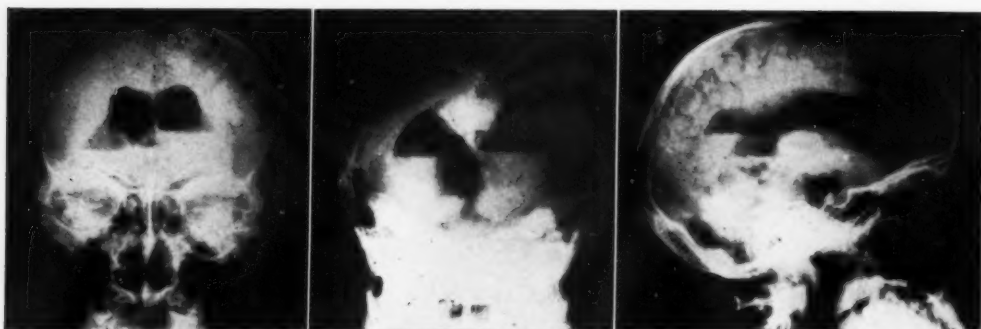


Fig. 2. Case 3; 43 days postoperative: Right frontoparietal defect 5.0×3.5 cm.; dura intact and no cerebral tissue loss; generalized, symmetrical dilatation of ventricles of moderate degree; slight shift of the system to the left, with obliteration of subarachnoid pathways on right.

Diagnosis: Post-traumatic ventricular dilatation. Mass lesion right. Operative findings of hygroma over right hemisphere.

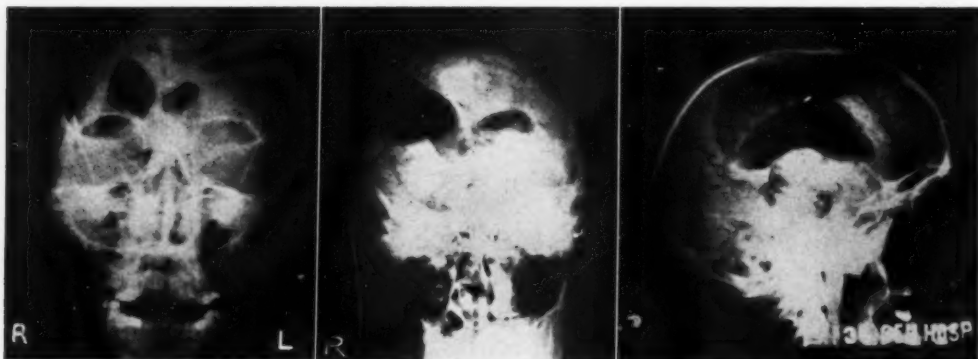


Fig. 3. Case 4; 77 days postoperative. Largest bone defect in this group of cases— 13×6 cm., right frontoparietal. This patient had had primary débridement and later a débridement of a complicating abscess, representing severe loss of cerebral tissue.

Marked dilatation of the right lateral ventricle is noted, with slight ipsilateral shift of the entire system. Slight enlargement of the left lateral is also present. There is a decreased subarachnoid air shadow on the right, accentuated on the unaffected side.

Diagnosis: Postoperative hydrodynamic compensation with ventricular enlargement and shift. Adhesive arachnoiditis, right.

tive periods of seventy-seven and ninety-five days, respectively. Case 4 presented the largest bone defect of the group, 13×6 cm.

Roentgenograms were made twenty-one days following the primary operation in Case 6, and the increase in the size of the ventricle at this period is shown in Figure 5. The effect of a perforating wound through the hemisphere associated with a bursting type of fracture (Case 7) is shown in Figure 6.

In Case 8 (Fig. 7) the first pneumocephalogram was done at fourteen days, the earliest of any of the series. This

patient had a large bone defect and had sustained severe tissue loss. Early but definite enlargement of the ipsilateral ventricle was demonstrated. A subsequent examination done at seventy-one days revealed progression of the dilatation with associated shifting of the ventricles to the affected side.

Marked enlargement of the fourth ventricle following occipital and suboccipital decompression with primary débridement and later removal of a shell fragment from the vermis of the cerebellum was found in Case 9 (Fig. 8). There was considerable associated dilatation of the posterior horn

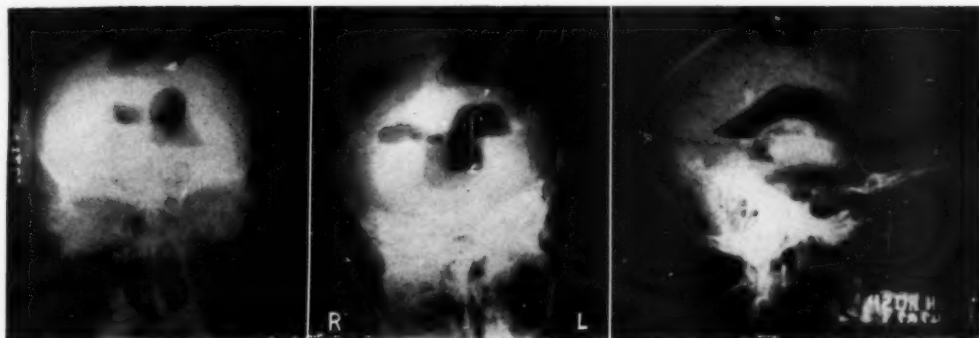


Fig. 4. Case 5: 95 days postoperative. This patient had had both primary wound débridement and secondary débridement of brain abscess, representing severe loss of cerebral tissue. Bone defect 3.5 cm. diameter, left parietal. Marked dilatation of left lateral ventricle with slight dilatation of right is noted. There is a slight ipsilateral shift of the entire system. No subarachnoid air pattern is evident on either side.

Diagnosis: Postoperative hydrodynamic compensation with ventricular enlargement and shift. Adhesive arachnoiditis, generalized.

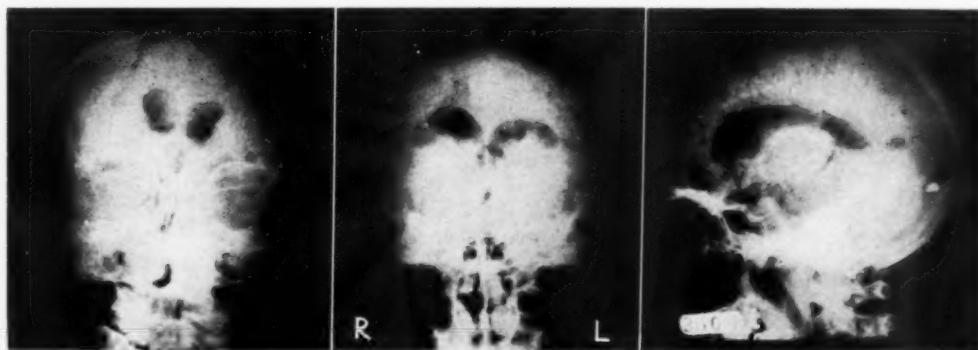


Fig. 5. Case 6: 21 days postoperative. Mid-frontal defect 3×6 cm. Shell fragment 7 mm. in diameter is seen in posterior fossa, having traversed the right hemisphere. Degree of loss of cerebral tissue not clearly defined in previous records.

Moderate dilatation of the right lateral ventricle and slight enlargement of left lateral and third ventricles. No significant shift is demonstrated. No subarachnoid air pattern is present on the right.

Diagnosis: Postoperative hydrodynamic compensation with ventricular enlargement. Adhesive arachnoiditis, right.

of the right lateral ventricle and moderate enlargement of the third ventricle. Absence of the subarachnoid air pattern over the posterior area was striking.

In Case 10 there was no brain tissue loss at the time of primary operation, and the ventricular pattern was normal except for a slight contralateral shift and an absence of subarachnoid air on the left, associated with a subdural hematoma (Fig. 9).

The only instance of a normal pneumoencephalogram associated with a considerable destruction of cerebral tissue is shown in Figure 10 (Case 11).

DISCUSSION

From the observations made upon this small group of cases, it appeared that ipsilateral ventricular enlargement usually followed the débridement of a brain wound. As the degree of brain loss increased, the ventricular enlargement became more diffuse, the enlargement reaching fully 200 per cent of normal, as in Case 1. In one instance, however (Case 11), the ventricular system was normal in spite of a significant loss of tissue. Usually, a severe loss of cerebral substance resulted in dilatation of the contralateral ventricle as



Fig. 6. Case 7: 61 days postoperative. Penetrating wound with bursting type of fracture. Degree of cerebral tissue loss at débridement was not clearly defined in early records. Bone defect 3×3 cm. in addition to defects produced by separation of bone fragments involving right frontal, parietal, and occipital areas.

Moderate dilatation of right lateral ventricle is noted, with slight enlargement of left lateral and third ventricles. No shift is present. Subarachnoid pathways are obliterated on the right. Cisternae slightly dilated.

Diagnosis: Postoperative hydrodynamic compensation with ventricular enlargement. Adhesive arachnoiditis, right.

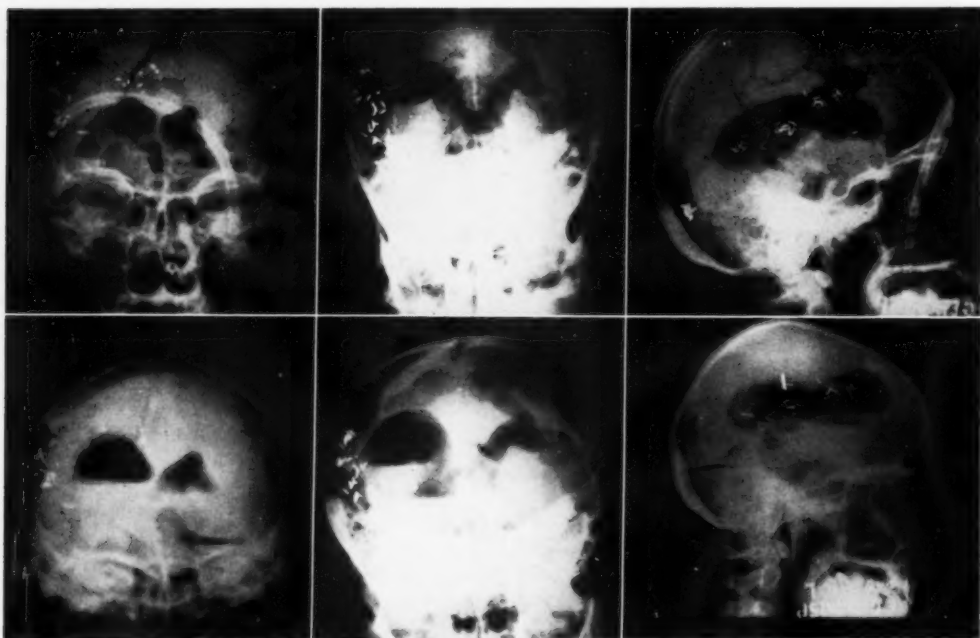


Fig. 7. Case 8: 14 and 71 days postoperative.

The three upper views, made 14 days postoperative, show severe cerebral tissue loss; bone defect 10.5×3.5 cm., right parietal. Moderate dilatation of right lateral ventricle is present. No significant shift is present. Subarachnoid space obliterated over right side and decreased on left.

The three lower views were made 71 days postoperative. The progression in the enlargement of the right lateral ventricle is illustrated, with generalized ipsilateral shift. Subarachnoid space not visualized.

Diagnosis: Postoperative hydrodynamic compensation with marked ventricular enlargement and slight shift. Adhesive arachnoiditis.

well as the ipsilateral one, and in a shifting of the entire system to the affected side.

At this early period, the ventricular dis-

tortions appeared to be related to the loss of brain tissue rather than to the size of the bony defect produced by craniec-

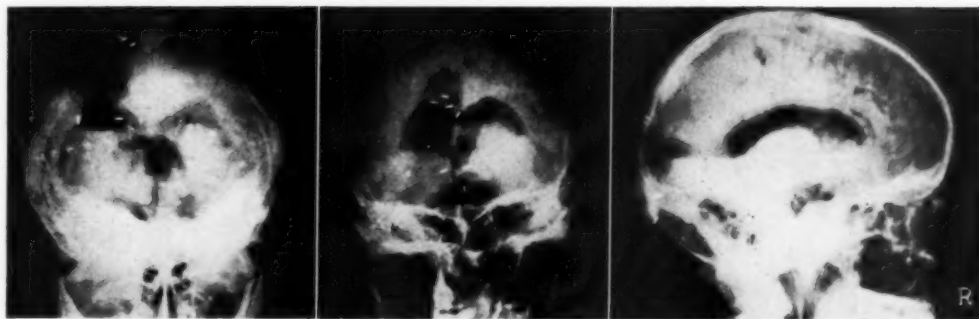


Fig. 8. Case 9: 66 days postoperative. Moderate loss of cerebral tissue; large occipital and suboccipital defect. Foreign bodies were removed from area adjacent to the fourth ventricle at secondary surgery.

There is considerable dilatation of the posterior body and horn of the right lateral ventricle, with moderate enlargement of the third and marked enlargement of the fourth ventricle. There is no significant shift of the system. Subarachnoid pathways are obliterated in the cerebellar area and over the posterior cerebrum. The cisternae are slightly dilated.

Diagnosis: Postoperative hydrodynamic compensation with ventricular dilatation posteriorly. Adhesive arachnoiditis, posterior.

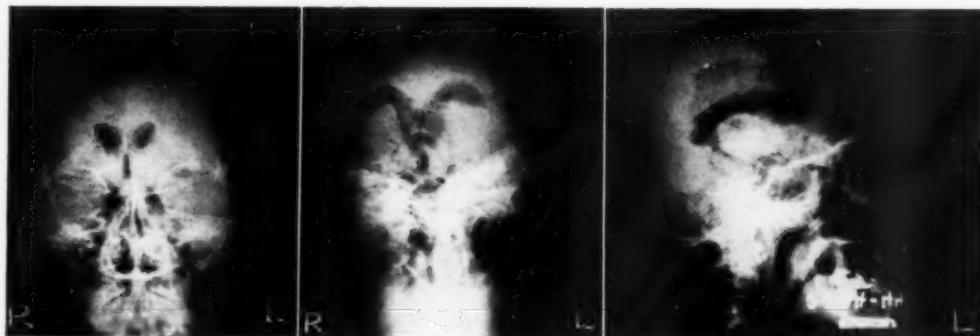


Fig. 9. Case 10: 28 days postoperative. No cerebral tissue loss; 4 × 10-cm. left frontoparietal bone defect; no ventricular dilatation; minimal shift of ventricles contralaterally. Subarachnoid pathways on the left are obliterated.

Diagnosis: Mass lesion left. Subdural hematoma. Arachnoiditis left.

tomy. Closure of the dura at the time of operation did not appear to be an important factor. It is of note that marked ventricular distortions occurred with small bone defects and in the presence of a tightly closed dura or dural graft.

Inasmuch as all of these patients had sustained definite brain injury, mainly severe, and were from a previously healthy group of young males, it would seem reasonable to exclude unrelated pathologic conditions in an appraisal of the pneumoencephalographic findings. Osmond (1) has reviewed the literature and presented the theories and evidence of Winkelman and Fay, Osnato and Giliberti, Penfield,

Grant, Dyke, and others, to explain the pneumoencephalographic findings in post-traumatic conditions of the brain. The presence of dilatation of the ventricular system following "closed" cranial injury has been repeatedly demonstrated. The mechanism remains controversial. The pronounced degree of dilatation in several of this group soon after débridement of brain tissue leaves little doubt that it was on the basis of hydrodynamic compensation. A definite volume of brain tissue had been removed and the space was filled first by fluid or swollen brain substance and later by the ventricles dilated as a result of the positive pressure of the cerebrospinal

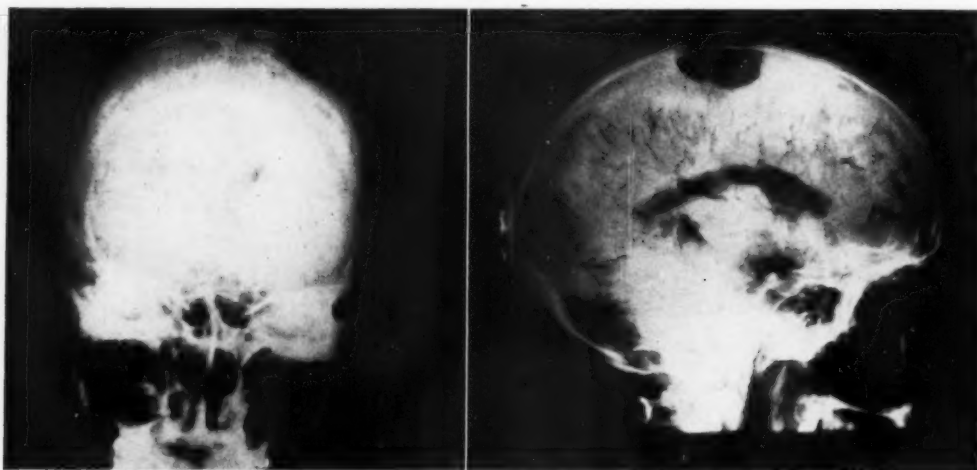


Fig. 10. Case 11: 63 days postoperative. There was severe loss of cerebral tissue and the bone defect was of moderate size (4 cm. in diameter). There is no ventricular dilatation or displacement. Subarachnoid pathways are obliterated only around the bone defect.

Diagnosis: Localized adhesive arachnoiditis. Otherwise normal encephalogram.

Note: This was the only patient in the series with severe cerebral loss who showed normal ventricular pattern.

fluid. The ipsilateral shift of the system is evidence of further compensation. Similar findings have been observed following the removal of brain tumors. When contralateral shift was demonstrated, it was suggestive evidence of a mass lesion, complicating the original trauma (four instances—see Figs. 1 and 2 and 9).

Contamination of the subarachnoid pathways undoubtedly occurred in the 206 cases of dural penetration. In many, infection was controlled immediately and little arachnoiditis or cerebritis developed. In others, the infection progressed to produce meningitis, either local or generalized. Both acute and chronic basilar meningitis with mechanical blocking of the normal pathways of cerebrospinal fluid outflow occurred in several patients. This phenomenon may be a factor in subsequent diffuse enlargement of the ventricular system.

Cicatrices in the cerebrum could not be evaluated as a factor in producing the distortion seen in this early phase. The presence of strictly localized protrusions was not significant.

The progression of the ventricular dilatation in Cases 1 and 8 (Figs. 1 and 7) would seem to indicate the future course in

many of these cases. The primary phase of change may be arbitrarily considered as that occurring during the first few months following injury. During this period the hydrodynamic effect is largely a mechanical factor compensating for the loss of cerebral tissue. Cerebral damage also has occurred, which may later contribute to atrophy and cicatrix formation resulting in slow but progressive dilatation. The common finding of localized or generalized adhesive arachnoiditis indicates a disruption of the normal cerebrospinal fluid elimination mechanism, which is of significance.

Although a number of brain wounds communicated with the ventricle, resulting persistent loculation of cerebrospinal fluid in the cavity created at operation did not develop.

Evidence of cerebral atrophy and porencephaly was absent, with possibly the exception of a small porencephalic cavity associated with the lateral ventricle in one case.

Two related clinical aspects of the postoperative period should be briefly mentioned. (1) Headache was uncommon in the uncomplicated wounds in spite of hy-

drodynamic changes. (2) Convulsions were also infrequent during the early phase or period, three months following operation. Of the 119 patients having dural penetrations in the first group, 14 had generalized or jacksonian convulsions. In 5 of this group the convulsions occurred after evacuation of complicating brain abscesses. All patients were given routine phenobarbital suppression therapy.

Late roentgen changes following penetrating wounds of the brain must be studied after the return of these patients to hospitals in the zone of the interior. In view of the early findings observed, it seems reasonable to predict that a further progression of ventricular dilatation will occur as a result of such factors as cerebral atrophy, cicatrix, arachnoid abnormality, and the bone defect.

SUMMARY

1. Twenty-three pneumoencephalographic studies of patients from a group of 256 with penetrating cranial wounds are reported.

2. Following loss of cerebral tissue, an enlargement of the ipsilateral ventricle was usually observed. When the loss of tissue was great, the contralateral ventricle also dilated and the ventricular system shifted to the affected side. The ventricular enlargement was usually proportional to the tissue loss.

3. Ventricular enlargement occurred at an early period following primary débridement.

4. Arachnoiditis was a common finding.

5. The influence of cerebritis, arachnoiditis, and the bone defect on later changes is postulated.

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Note: Bibliography is of necessity limited due to lack of available reference material under conditions of army field operation.



Scout Film of the Abdomen¹

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A "SCOUT FILM" of the abdomen is one obtained without the use of a contrast medium or any preparation on the part of the patient. Such an examination is usually an emergency procedure and is often done at the bedside. That it has not received the recognition it deserves is the fault of the roentgenologist, who has not brought its value as a diagnostic aid in acute abdominal conditions to the attention of the surgeon. Upon the former it makes special demands. Used to regular hours and "Sundays off," he is too often not available for an emergency x-ray examination. These acute cases, however, do not choose their time of entry; they are as likely to come in after hours or on a week-end as at a more convenient time. Unless the roentgenologist is prepared for emergency calls, he will not cultivate "x-ray mindedness" on the part of the surgeon. On the other hand, if he is prepared for such inconveniences as are entailed, he will be well rewarded by the satisfaction of a diagnosis well made and the knowledge that a life-saving procedure was due in great part to his co-operation.

Most acute conditions of the abdomen have a well established history, with well known physical findings. It is not with such cases that this paper is concerned, though they may require an x-ray examination to substantiate the diagnosis. It will deal, rather, with the obscure case, in which the history is unsatisfactory, or physical findings are inadequate, and further aid in diagnosis is required.

We have found a "scout film" of the abdomen of significant aid in substantiating or establishing a diagnosis in the conditions discussed below.

Perforated Ulcer: The diagnostic value of the demonstration of free air in the abdo-

men, between the liver and diaphragm, in the upright film as an indication of a perforated ulcer is well known (Fig. 1). An additional anteroposterior view in the lateral decubitus position, with the left side down, is desirable and as a sole view is to be preferred. This view can easily be made at the bedside and, in one instance, has shown the air where the upright view failed (Fig. 2). While the condition of the patient may be such that an upright film is difficult to obtain, it is easy for him to roll on his left side for a lateral decubitus view. Another advantage of the lateral decubitus position is the avoidance of a possible error which once occurred, when a diagnosis of a perforated viscus was made on a right-sided stomach. The normal gas-bubble was mistaken for free air in a patient with acute abdominal pain. A lateral decubitus film would have prevented that error.

Non-Opaque Ureteral Stone: Although strictly speaking the diagnosis of a non-opaque ureteral stone is not made without further x-ray examination, the condition may be included here. The abdominal findings are important in a negative sense, in that no abnormal bowel dilatation may be present. If the stone is on the right side, a clinical differentiation of ureteral colic from an acute appendicitis may prove difficult. Such a stone may block the ureter and as a result the characteristic finding of blood in the urine may be absent. An intravenous pyelogram can be made without upsetting the patient. If necessary, the films can be taken at the bedside with the aid of a stationary grid. The significant finding for a diagnosis of a stone in the ureter is the anuria which may be present on the affected side, while the opposite side shows normal excretion.

¹ Material gathered from civilian practice, Mt. Zion Hospital, San Francisco, prior to entry into the Army. Presented at the Joint Meeting of the American Roentgen Ray Society and the Radiological Society of North America, Chicago, Ill., Sept. 24-29, 1944.

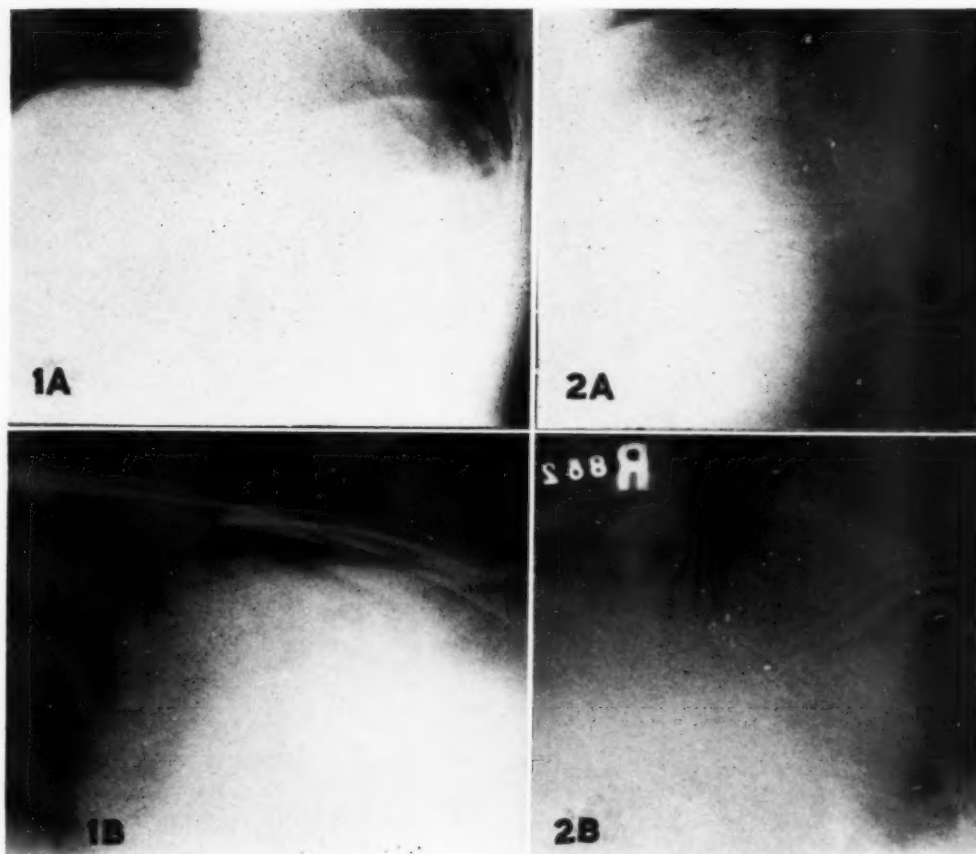


Fig. 1. Perforated ulcer. A. Upright film of abdomen demonstrating free air beneath the diaphragm. B. Lateral decubitus view of abdomen with patient lying on the left side, demonstrating free air in the peritoneal space between the liver and thoracic cage.

Fig. 2. Perforated ulcer. A. Upright film of abdomen. No air is demonstrated. B. Lateral decubitus view of abdomen showing a small amount of air in the peritoneal space between the liver and thoracic cage. This view is preferred.

There may be failure to excrete the dye on the side of the stone, due to spasm of the kidney pelvis. The kidney on the affected side appears increased in density because of the dye in the tubules. This finding is sufficient for diagnosis of non-opaque stone in the ureter (Fig. 3). It must be borne in mind that both kidneys may not excrete the dye at the same time, and repeated films must be taken until all the dye is excreted before the conclusion is reached that one side fails to function. If the involved side should excrete the dye, dilatation of the ureter above the calculus is diagnostic of a block.

Ileus; Small Bowel Distention: Before undertaking a discussion of small bowel distention, we must first have an understanding of the normal and a clear conception of the dynamics of the bowel and physiological changes. This knowledge we must translate into a mental picture of the bowel (1). Only so can we evaluate the changes we may see on the film. A clear knowledge of the origin and importance of the gas in the bowel must be had, since it is the gas-filled intestinal loops that give the clue to the diagnosis.

The normal film of the abdomen may show gas in the stomach, duodenal bulb,



Fig. 3. Non-opaque stone in the left ureter. Normal excretion of dye on the right; no excretion on the left side.

and colon; gas in the small bowel is abnormal except in infants. There are three sources of gas in the bowel: 68 per cent is swallowed air; 22 per cent is due to diffusion from the blood stream; 10 per cent is the result of digestive fermentation (2). The swallowed air seen in the stomach is broken into small bubbles in the jejunum and carried in solution with the intestinal contents. Interference with the normal passage of the latter will affect the gas held in solution; it will be thrown out of solution and be seen on the film. There are two abnormal situations in which gas will be found in the small bowel. One is a paresis of the bowel, in which there is lack of peristalsis. This is a paralytic (or adynamic) ileus. The other is a mechanical block in the lumen—mechanical or dynamic ileus. If we keep in mind the underlying cause of each and apply that information to the interpretation of the films, we can distinguish the two types, as they give a different picture (3).

Paralytic or adynamic ileus represents a reflex inhibition (2). The intestinal tract

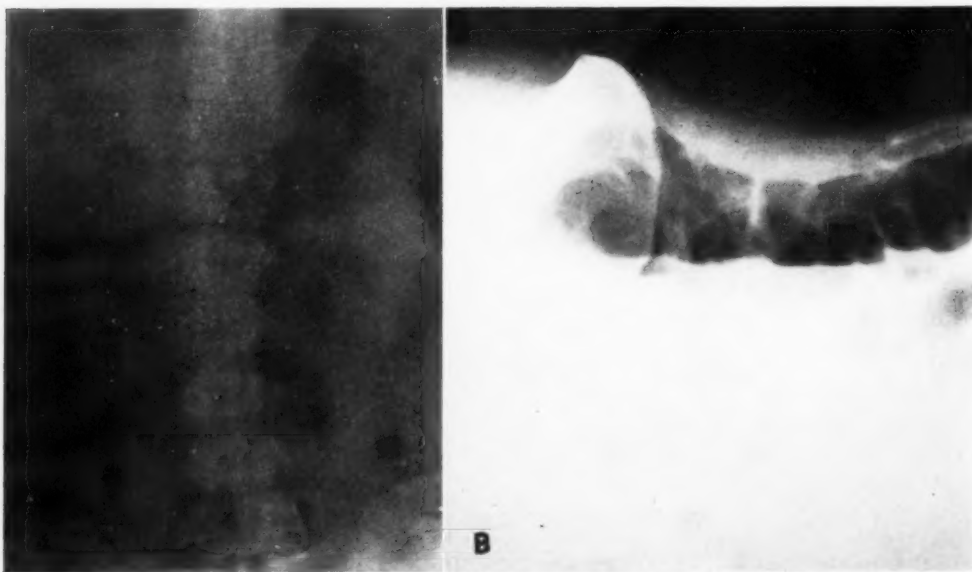


Fig. 4. Paralytic ileus. A. Anteroposterior view in prone position. There is a moderate distention of both the small and large bowel. The small bowel distention is of a segmental nature, i.e., not one continuous loop. B. Lateral decubitus view, patient lying on left side. There is free movement of the loops. All the gas rises so that there is one horizontal fluid layer in the multiple loops of distended small bowel. The loops are shallow, the horizontal diameter of the gas collections tending to be greater than the vertical diameter.



Fig. 5. Mechanical small bowel obstruction. A and B. Anteroposterior views in prone position. There is a continuous distention of the small bowel, which is markedly dilated. The coils tend to lie horizontal, with sharp hair-pin turns, giving so-called "step-ladder" appearance. A short interval elapsed between views A and B. Note different arrangement of the loops. The bowel is active, "dynamic." C. Lateral decubitus view with right side up. Fluid in the bowel can be seen only with the patient in this position or upright, as the x-ray must be directed horizontally. The gas in the bowel rises and fluid settles, so that the fluid in all the loops of bowel tends to be in the same horizontal plane. Gas is seen in the colon, which lies in the flank at right angles to the distended small bowel. The colon is of normal size, whereas the small bowel is distended. The gas in the distended loops is greater in vertical diameter than in the transverse.

is innervated by sympathetic and parasympathetic fibers. The former inhibit while the latter stimulate peristalsis. Stimulation of the sympathetic fibers or inhibition of the parasympathetic will result in cessa-

tion of peristalsis. Intestinal absorption takes place within the numerous villi lining the surface of the small bowel. The constant change in shape of the villi with intestinal peristalsis provides new surfaces

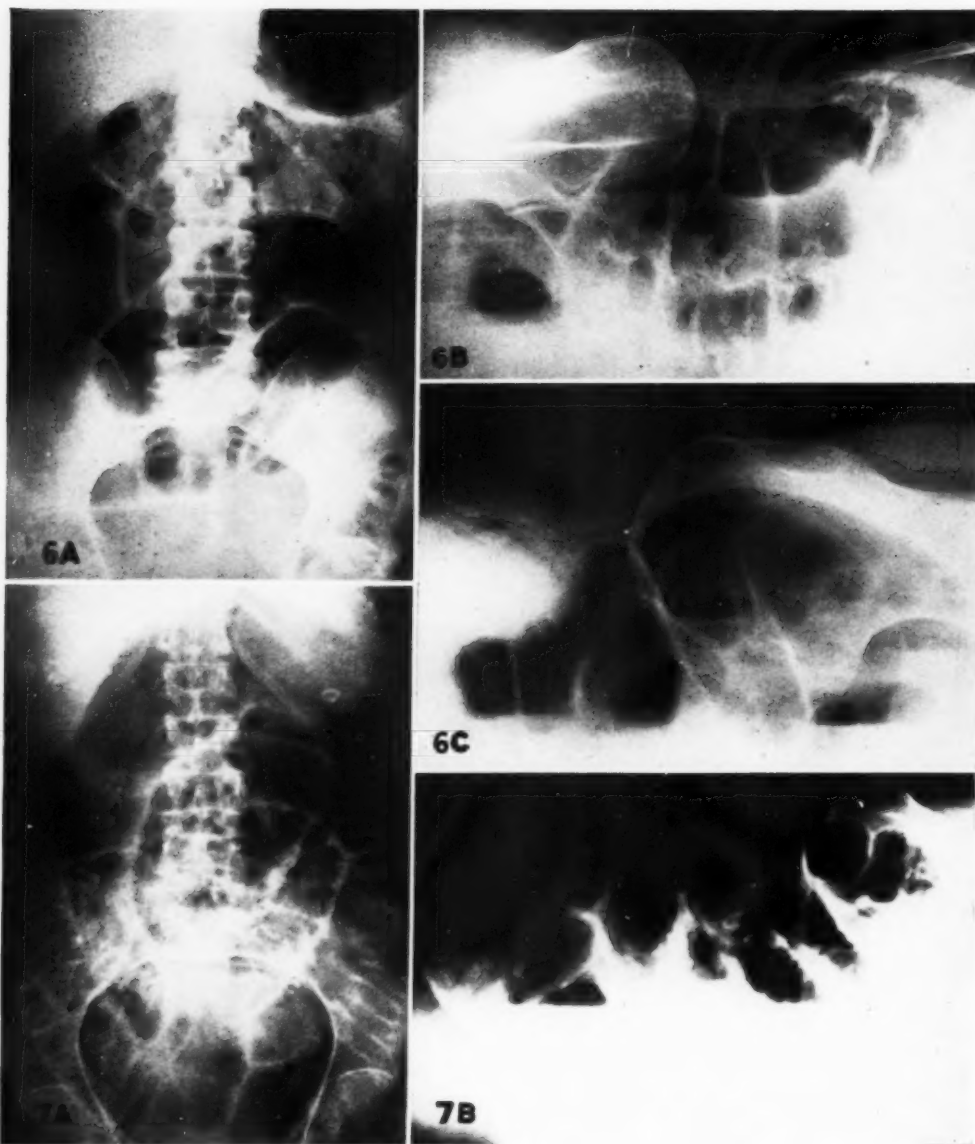


Fig. 6. Mechanical small bowel obstruction. A. Anteroposterior view in prone position. Continuous distention of small bowel. The small bowel lies in the middle of the abdomen. The lower loops of ileum are usually smooth. B. Lateral decubitus view with left side down. C. Lateral decubitus view with right side down. There is free movement of the loops of distended bowel. With change in position, the gas all tends to rise and the fluid to settle in the most dependent portion, resulting in a single horizontal fluid level.

The colon is seen distended with gas in these views, but is of normal size, whereas the ileum is distended. Note also the sharp hair-pin turns in the small bowel.

Fig. 7. Mechanical small bowel obstruction. The valvulae conniventes, which give the "herring-bone" or "coiled-spring" appearance to the small bowel, are unusually prominent. They diminish in number as we go down the ileum. They are better seen in the lateral decubitus position.

for absorption. With cessation of peristalsis, no new surfaces are exposed, the gas present is no longer held in solution, and is evident on the film. Since the nerve supply is the same to the small and large bowel, gas will be seen scattered throughout both, and they will be distended in the same relative proportion. The distended loops in paralytic ileus do not reach the size of those of mechanical obstruction. The gas-filled loops in the small bowel and the colon are not continuous, but small scattered loops are present. There is, however, a free flow of intestinal contents between them, as can be seen by a film taken in the lateral decubitus position. The gas all rises so that the fluid levels in the various loops are in the same horizontal plane (Fig. 4).

Paralytic ileus is responsible for the distention which follows abdominal surgery. In an x-ray study of the abdomen in post-operative cases its incidence was found to be 75 per cent (4). It was present immediately following surgery, disappearing on the third to the fourth postoperative day. It is at the time of disappearance of this paralytic ileus that the patient complains of "gas pains," which are probably due to resumption of peristalsis. Paralytic ileus is also the type that follows emotional disturbances such as fear, fright, and pain. It is an annoying accompaniment of instrumentation during cystoscopy and often obscures the pyelogram. It is found in spinal cord injury and severe fractures of the extremities. It is not a serious condition. The usual therapy of flushes and peristaltic stimulants do not affect its course. Spinal anesthesia to block the sympathetics may relieve the distention and bring about a restoration of peristalsis. Fatal sequelae do not follow, but differentiation from the more serious mechanical obstruction of the small bowel, which does require immediate therapy, is important. A localized paralytic ileus is also found with inflammatory lesions within the abdomen. This will be discussed later.

Mechanical obstruction results from an interruption of the free flow of intestinal

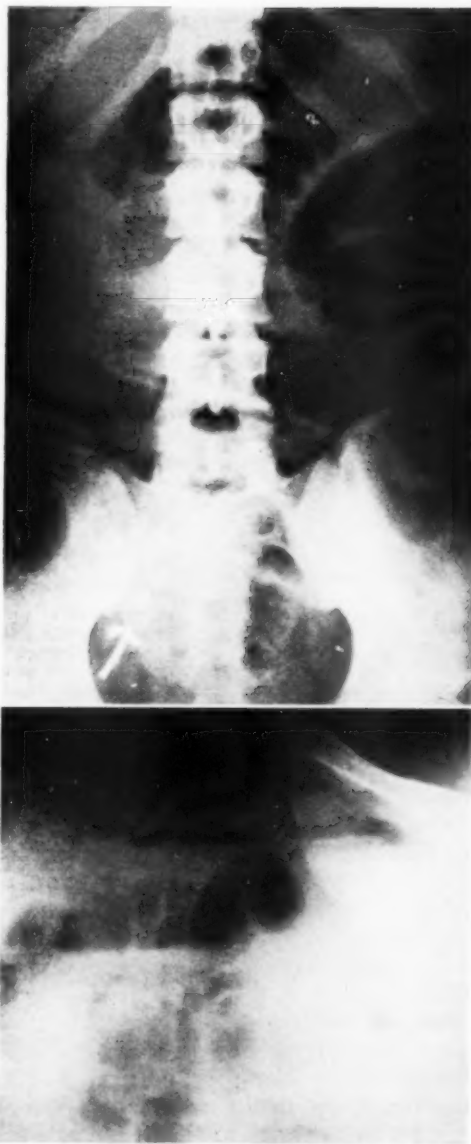


Fig. 8. Small bowel mechanical obstruction by gallstone in the terminal ileum.

contents. The block may not be complete, but, whether it is complete or incomplete, changes will be found on the x-ray film. The causes of mechanical obstruction are numerous. Included among them are new growths, cicatrizing enteritis, adhesions which kink or compress the bowel, volvu-



Fig. 9. Peritonitis. A. Anteroposterior view in prone position. Distended loops of small bowel. The true nature of the underlying condition is not appreciated in this view. Films must be taken with the x-ray directed horizontally. B. Upright view. The loops of small bowel are fixed in position giving multiple horizontal fluid layers. The loops are shallow, greater in transverse than vertical diameter, characteristic of a paralytic bowel. The peritoneal fat line is obliterated but this is not well demonstrated on this reproduction.

lus, intussusception, and unreduced hernia, both internal and external. A localized infection such as an appendiceal abscess may cause local spasm, which halts the progress of the intestinal contents, or the fibrin of the localized peritonitis may cause adherence of loops of small bowel producing an acute angulation. Mechanical small bowel obstruction has been caused by an impacted gallstone at the ileocecal valve, and by tumor, such as lymphoblastoma, at the terminal ileum. An ingested foreign body perforating the small bowel, causing a local irritation, has also resulted in a mechanical obstruction. An unusual case was one in which the small bowel became adherent to a perforated bladder. The bowel was acutely angulated and mechanical obstruction resulted. Edema of the bowel caused by low plasma protein concentration may also result in obstruction (5). Mechanical obstructions must be differentiated from paralytic ileus, because if unrecognized and untreated they may prove fatal. If, however, diagnosis is

made early and proper treatment is instituted—the most important measure being decompression of the bowel—fatalities can be avoided.

An important fact which is not generally appreciated is that an almost complete low small bowel mechanical obstruction can exist for some days with minimal or no symptoms. This was mentioned as early as 1921 by Kloiber (6), who found 9 cases with a positive x-ray diagnosis but without clinical symptoms in a series of 77 examinations. Indeed, the patient's appearance may belie the seriousness of his condition. In a daily follow-up postoperative study by x-ray examination, two patients were found to have a low small bowel mechanical obstruction. Although the films showed progressively increasing distention, there were no complaints or physical signs of obstruction until the tenth and eleventh day, respectively. At that time there was a sudden collapse, with nausea, vomiting, increased pulse rate, and increased respirations. Such collapse has been explained (7)

as due to afferent impulses from the distended bowel, producing vomiting and fall of blood pressure. X-ray examination of the abdomen should be done early in every case of distention where possibility of a mechanical bowel obstruction is present. One should not wait for collapse to institute treatment or to make the diagnosis, since that may not occur until late in the course. Treatment to relieve the distention should be instituted as soon as a diagnosis is made by x-ray. The fact that a patient has a bowel movement does not exclude obstruction. The bowel distal to the obstruction will continue to evacuate its contents.

If we go over the stages of a mechanical obstruction, we can easily visualize the appearance on the x-ray film. When obstruction occurs, the proximal bowel dilates. There is an interference with absorption, and the gas present in the intestinal contents is thrown out of solution. To overcome the obstruction, peristalsis becomes vigorous; the loops shorten and widen, and in films taken at brief intervals appear in different arrangements (Fig. 5). In rearranging themselves, they take the shortest course in the abdomen, which is transverse. One continuous loop of gas may be seen extending to the obstruction. Distal to the obstruction there is no gas and usually no gas is to be seen in the colon. Even if gas should be present in the colon, as it sometimes is in patients who have received an enema just before entering the hospital, there will be no unusual distention. This is different from the findings in paralytic ileus, in which the colon and small intestine are equally distended. In mechanical obstruction, distention is limited to the bowel proximal to the obstruction. Another difference is the continuous distention of the small bowel in mechanical ileus and the segmental distention in the paralytic type.

The appearance of the bowel itself also differs in the two conditions. In the paralytic bowel the loops are shallow; in the presence of mechanical obstruction they are large and dark and are greater in the

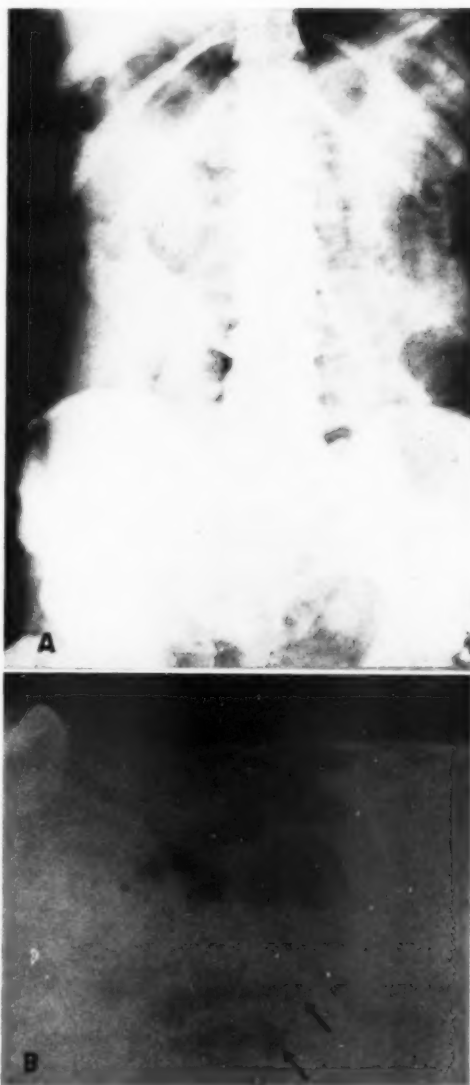


Fig. 10. Peritonitis. A. Anteroposterior view in prone position. Distended loops of small bowel in left side of abdomen. The appearance of the bowel is that of mechanical obstruction. The underlying condition cannot be appreciated in this view. Upright or lateral decubitus views are necessary. B. Lateral decubitus view with right side up. Multiple loops of small bowel are seen in the lower left side, fixed in position, resulting in multiple fluid levels. The loops are shallow, greater in transverse diameter than vertical, characteristic of paralytic ileus. The large distended loops in the right upper quadrant are distended stomach and gas in the colon. The properitoneal fat line is obliterated but this is not well demonstrated on the reproduction.

vertical diameter than the transverse (6). In mechanical obstruction the circular folds

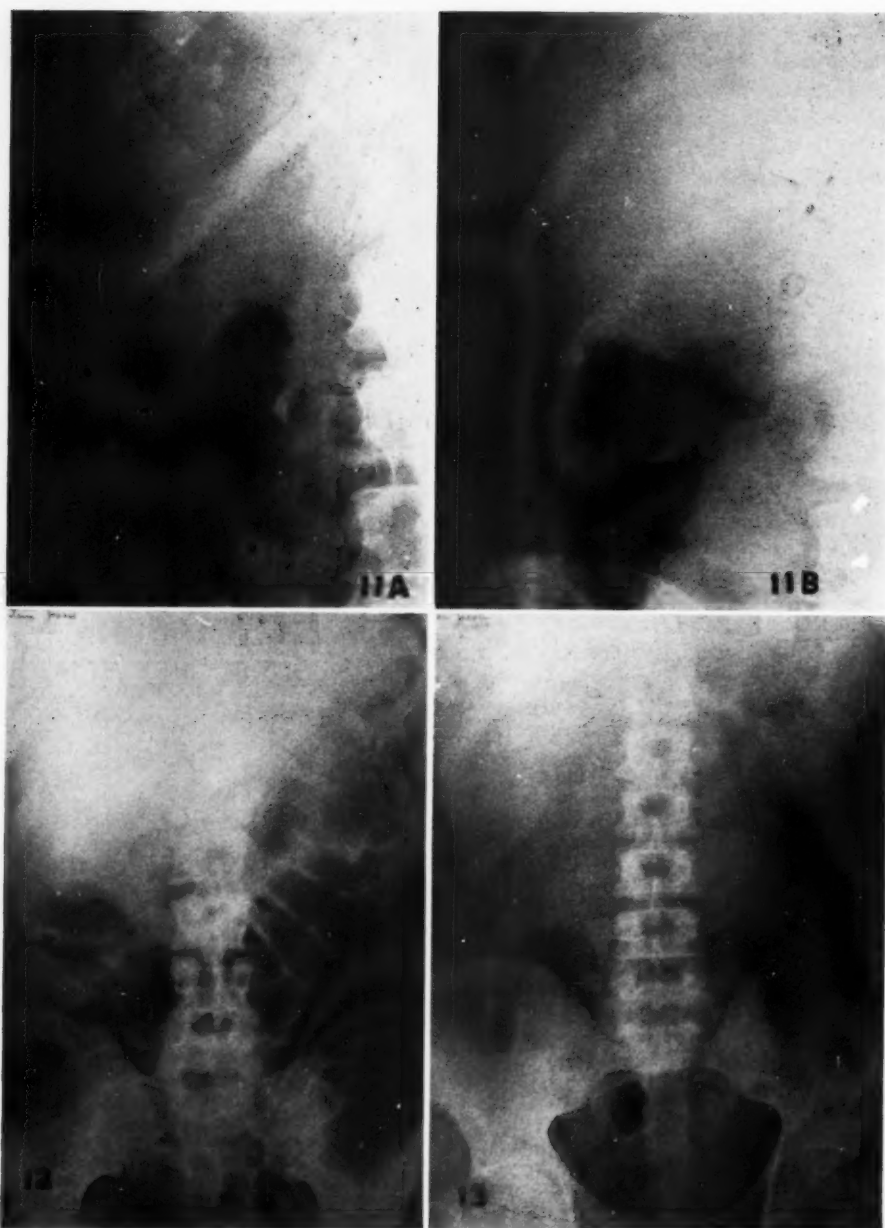


Fig. 11. Acute gallbladder disease. Localized loop of distended small bowel ("sentinel loop") present in right upper quadrant on repeated examination (A and B).

Fig. 12. Subhepatic abscess. Localized loop of small bowel ("sentinel loop") constantly present in subhepatic region. The properitoneal fat line is absent, which led to a diagnosis of abscess rather than an acute inflammation.

Fig. 13. Acute appendicitis. Localized ileus ("sentinel loop") in right lower quadrant.

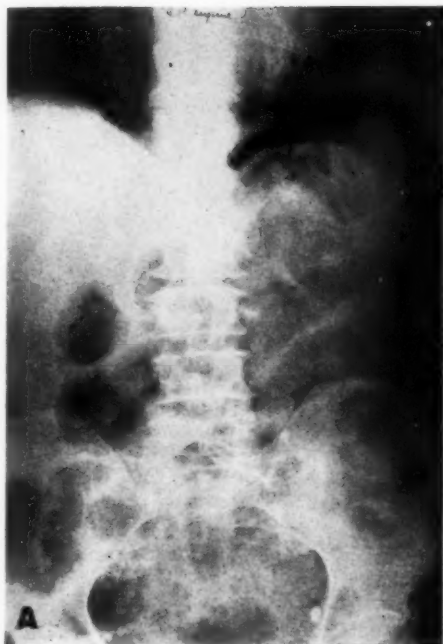


Fig. 14. A. Perforated diverticulitis with localized abscess. Anteroposterior view in prone position. There are several loops of distended small bowel in the left side of the abdomen, above the iliac crest.



Fig. 14. B and C. Same case as shown in 14, A. B. Lateral decubitus view with right side up. Gas is seen in the cecum and ascending colon. Note the properitoneal fat line, which is represented by a dark stripe in the flank, parallel with the colon. There is a differentiation between the properitoneal fat, the muscles, and the subcutaneous fat. C. Lateral decubitus view with left side up. The properitoneal fat line is lost. The differentiation between layers of muscle and fat is lost. The soft-tissue shadows of the flank are enlarged as compared to the normal. Some loops of small bowel are seen in the neighborhood.

are prominent, giving an impression of a spring ready to uncoil, and there is marked contrast between the gas-distended bowel and the rest of the film. The coils have sharp hair-pin turns and as a result of peristalsis some will be indistinct. As pointed out above, vigorous peristalsis is present, so that successive films show different arrangements of the loops. There is free communication between the loops of bowel, as is the case, also, in paralytic ileus. This is well shown in films made in the lateral decubitus position. The gas rises, the loops re-arrange themselves, and the fluid all tends to lie in the same horizontal plane. This fluid is not demonstrable in the supine anteroposterior view. It can be shown only by a horizontally directed ray with the patient in the lateral decubitus position or upright (Fig. 6). With release of the tension within the lumen of a mechanically obstructed bowel, either by Miller-Abbott tube or surgery,

there is a prompt return to normal. There is no loss of tone. If x-ray examination continues to show distended bowel, an obstruction either has been overlooked or has not been relieved.

It is necessary to recognize the characteristics of the distended small bowel and not to confuse it with the colon if an erroneous diagnosis is to be averted. Starting at the jejunum and diminishing in number in the course of the bowel are the valvulae conniventes, reduplications of mucous membrane containing the villi. The two layers of the valvulae conniventes are bound together by submucous connective tissue.



Fig. 15. A. Intra-abdominal adhesions: partial small bowel obstruction. Anteroposterior view in prone position. Distended loops of small bowel in the left side of abdomen.

These folds are permanent, running at right angles to the long axis, and cannot be obliterated no matter how great the distention. The undistended bowel is smooth, but when distention occurs these circular folds become prominent, producing a "hering-bone" or "coiled-spring" appearance. The lower ileum is usually smooth (Fig. 7).

If the obstruction is high, vomiting will be an early symptom. Toxemia and death may follow from loss of chlorides and fluid. With low obstruction, vomiting will be late. As soon as the bowel distends from the accumulated gas, there is an interference with absorption. A vicious cycle is started. Gas produces distention. Distention interferes with absorption, so that more gas and fluid accumulate. Fluid also accumulates as a result of increased activity of the glands of the bowel. The bowel shortens, giving less absorptive sur-



Fig. 15. B. Lateral decubitus view of case shown in 15, A, with right side up. Note fixed loops of small bowel with fluid level to right and left of spine. The peritoneal fat line is also well seen.

face. All this tends to increase pressure within the lumen, which is the important factor in the fatal turn of events.

In the upper ileum the venous channels lie primarily beneath the muscular coat, but in the lower ileum they are mostly submucous. With an increase in intraluminal pressure, the latter veins are easily collapsed. The arteries continue to pump blood, but the veins cannot return the flow. The blood finally seeps through into the lumen of the bowel, adding to the pressure. Pressure necrosis, gangrene, and perforation of the bowel wall follow, with a resulting peritonitis.

Mechanical small bowel obstructions are frequently overlooked following surgery. Postoperative distention is too often attributed to paralytic ileus when the underlying cause is a mechanical obstruction. It may be due to an overlooked adhesive band, an internal herniation, fibrin binding together two loops of bowel, or adherence of a loop of bowel to a raw surface of the peritoneum not properly peritonealized.

Peritonitis: Peritonitis may first show up on the x-ray film as a mechanical obstruction. Fibrin may bind two loops of bowel together, causing an acute angulation and obstruction. Exudate in the abdomen may make its presence known by increased density between the gas-filled loops. With spreading peritonitis, there



Fig. 16. A. Intra-abdominal adhesions: partial small bowel obstruction. Anteroposterior view in prone position. Several large loops of distended small bowel in left side of abdomen.

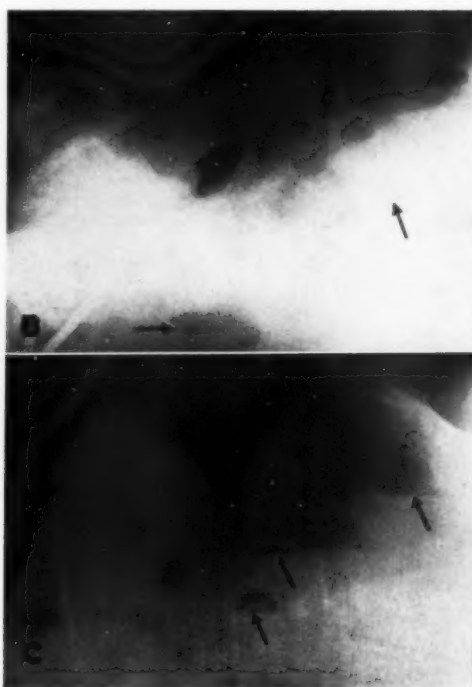


Fig. 16. B and C. Lateral decubitus views of case shown in Fig. 16, A, right side up (B) and left side up (C). Note multiple loops of small bowel fixed in position. They differ from the fixed loops of peritonitis in that they are not shallow. The properitoneal fat line (not well seen on reproduction) is present on both sides. History and other clinical findings would differentiate this condition from peritonitis.

is a tendency for the loops of small bowel to become adherent by plastic exudate and fixed in position. These fixed loops can best be seen on films made in the upright or the lateral decubitus position. Instead of gas rising to the upper level, producing a horizontal fluid level, as in mechanical and paralytic ileus, we see fixed loops scattered through the abdomen, with fluid at various levels (Figs. 9 and 10). With the persistence of peritonitis, the mechanical dynamic bowel becomes a paralytic adynamic bowel, as the result of the inhibitory impulses due to irritation of the peritoneum (8). The bowel now is shallow, the transverse diameter greater than the vertical.

Another sign may be present which signifies exudate in the abdomen, though absence of the sign does not exclude the occurrence of an exudate. This is the appearance of the properitoneal fat line. The peritoneum is lined with endothelium,

next to which is a layer of fat demonstrable on properly exposed films² as a dark stripe. Exudate may infiltrate the fat so that it is not visible on the film. This sign is most important in the diagnosis of localized abscess, which will be discussed below.

To recapitulate, a diagnosis of generalized peritonitis can be made in the presence of distended loops of small bowel fixed in position, usually of a paralytic nature, seen in the lateral decubitus or upright films, fluid between the loops of bowel, and obliteration of the properitoneal fat line.

Inflammatory Lesions and Localized Abscess: An inflammation may cause a localized ileus. The physiological basis for

² Such films are taken with a bedside unit, about 60 kv., 25 ma. sec., 3.0 mm. aluminum filter, to avoid "burning out" of the flank.

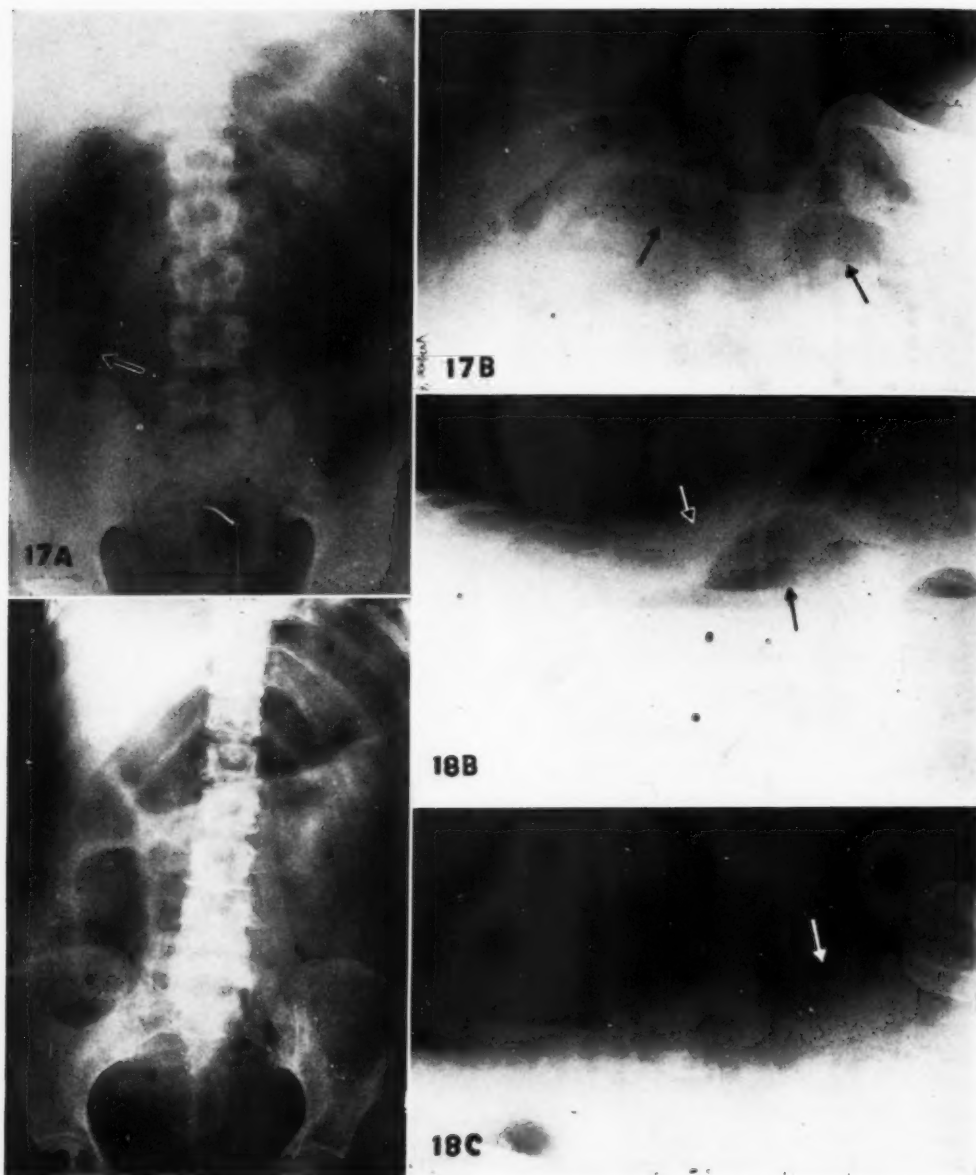


Fig. 17. Acute appendicitis; localized ileus. A few loops of small bowel are distended in the right lower quadrant. (See also Fig. 13.)

Fig. 18. Acute appendicitis; localized abscess. A. Anteroposterior view in prone position. Dilated loops of small bowel in right lower quadrant. B. Lateral decubitus view with right side up. A few loops of dilated small bowel are seen. The properitoneal fat line is obliterated (compare with C). The abdominal wall has lost the demarcation of the layers of muscle and fat and appears swollen. C. Lateral decubitus view with left side up. The properitoneal fat line is well seen. The distended ileum on the right side does not rise; it is fixed in position.

this was demonstrated by Alvarez and Hosoi (8), who proved experimentally that irritation of the peritoneum produces an

inhibitory impulse on the digestive tract. This is often well seen in acute gallbladder disease and acute appendicitis, when a



Fig. 19. A. Acute appendicitis; localized abscess with a small bowel mechanical obstruction. Anteroposterior view in prone position. There is a continuous dilatation of all the small bowel, of a mechanical nature.

single loop of distended ileum may persistently be present. This is aptly called the "sentinel loop." With abscess formation, an additional sign may be observed. The properitoneal fat becomes infiltrated by pus or is edematous (9). Abscesses deep in the pelvis, or covered with omentum so that they are not adjacent to the peritoneum, will fail to give the sign of obliterated properitoneal fat line (Figs. 11-14).

Intra-Abdominal Adhesions: Adhesions within the abdomen can be present without any discomfort to the patient. At times loops of small bowel may be caught and become partly obstructed. The obstruction may go on to a complete vascular occlusion and gangrene. It is only at the time of obstruction that symptoms appear, usually in the nature of cramp-like pain. A "scout film" may give evidence of such partial obstruction, but it must be taken at the time symptoms are present. Distended loops of small bowel which

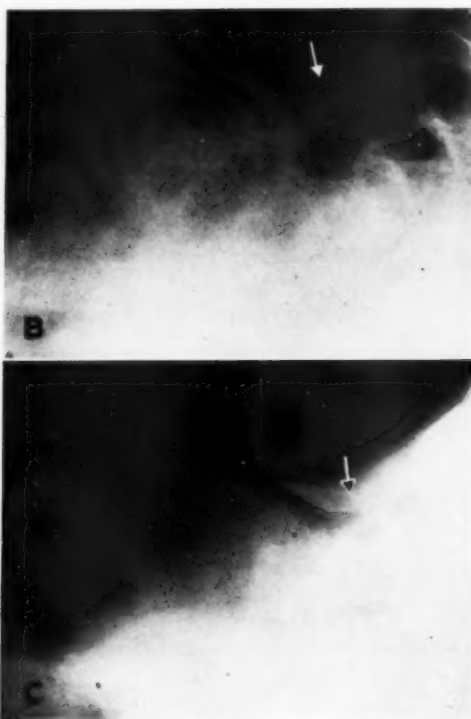


Fig. 19. B and C. Same case as Fig. 19, A. B. Lateral decubitus view, right side up. The right lateral wall is swollen and the properitoneal fat line is obliterated. Soft tissue differentiation is lost. C. Lateral decubitus view, left side up. The left lateral wall is normal, with properitoneal fat line present.

remain relatively fixed in position are demonstrable on films in the prone, upright, and lateral decubitus positions. Between attacks there may be no roentgen findings.

Fixed loops of small bowel, as mentioned above, may also be present in localized infection. It may not be possible to differentiate between distended loops due to localized infection and those of partial obstruction. The absence of the properitoneal fat line is diagnostic of infection, and the history and other findings will easily clarify the two conditions. With infection, we have all the characteristic findings of inflammation, *i.e.*, elevated temperature, high white blood cell count, and local tenderness. Partial obstructions due to adhesions are found in patients who are ambulatory, with a vague history of



Fig. 20. Appendiceal abscess. The properitoneal fat line is absent in the right lower quadrant; the right flank is swollen. The cecum is elevated and displaced medially by the appendiceal abscess.

Fig. 21. Ileocolic intussusception. Dilated cecum containing within its lumen a second loop of bowel, which is narrowed at its entrance into the cecum. The small bowel distal to the intussusception is moderately dilated.

occasional cramp-like pains, a normal temperature and white blood cell count. In the neglected case of mechanical obstruction from adhesions, however, there may be vomiting, elevated temperature and

pulse rate, and increased white cell count, indicating that the single-loop partial obstruction has advanced to a complete obstruction, with possible perforation or gangrene (Figs. 15 and 16).

Acute Appendicitis: The diagnostic criteria of acute appendicitis are so well established and the diagnosis is so often correctly made, that few cases are sent for scout films. Occasionally, however, patients are seen with appendicitis where there is some doubt as to diagnosis. This is especially true in the aged and in children, where the classical syndrome is absent. A sufficient number of "scout films" have been made so that certain features have been found to be present. The findings depend in large part on the location of the appendix and the pathological state when the examination is performed. The pain of acute appendicitis may incite paralytic ileus, a finding which is common to pain whatever the cause. With infection reaching the serosal layer, a reflex stimulation of the sympathetic fibers may cause local ileus (Fig. 17). With the presence of exudate about the appendix, the properitoneal fat line may become obliterated in that region, provided the appendix does not lie in the pelvis or is not covered with omentum (Fig. 18). With development of an abscess, loops of bowel may become adherent and angulated, resulting in mechanical bowel obstruction (Fig. 19). The abscess may elevate and displace the cecum (Fig. 20).

Intussusception: A mechanical bowel obstruction may result from an intussusception, depending on the extent of the narrowing of the lumen by edema of the bowel. X-ray examination by barium enema is advocated by many authors (10, 11, 12) to establish the diagnosis. It has been possible in our experience, on the only two occasions of ileocolic intussusception in which a scout film was taken, to make such a diagnosis without the aid of barium (13). One patient had additional small bowel distention of a mechanical obstructive nature. A distended cecum containing a distended loop of ileum narrowed at



Fig. 22. Obstruction to the colon with small bowel dilatation. Distended small bowel of a mechanical nature with distention of the cecum and ascending colon.

its entrance into the cecum was the diagnostic feature (Fig. 21).

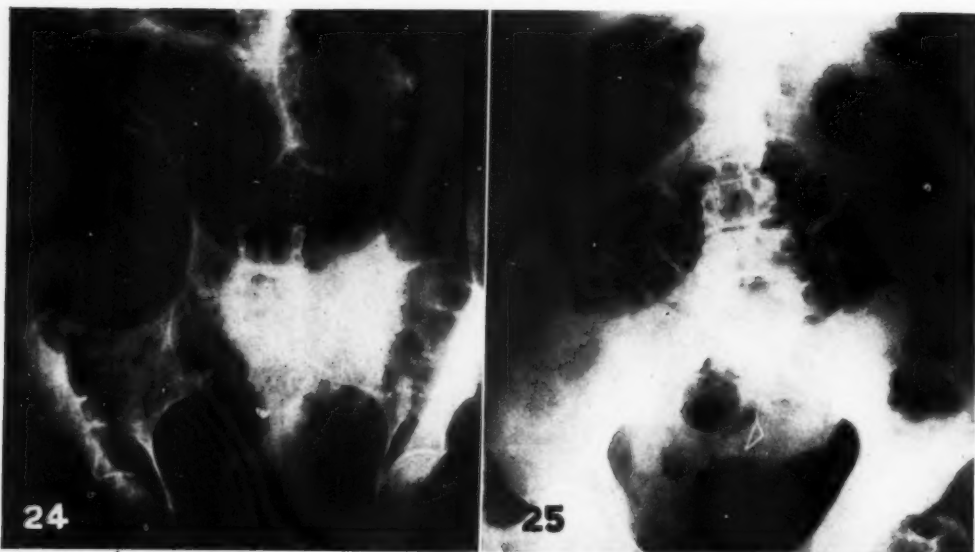
Obstruction of the Colon: Obstruction of the colon is usually due to carcinoma or volvulus. The differential roentgen findings are based on the difference between a slow-growing obstruction and a sudden one. A carcinoma will cause distention of the bowel proximal to the obstruction and sometimes of the small bowel. The appear-



Fig. 23. Barium enema demonstrating block of hepatic flexure.

ance of the latter is that of a mechanical obstruction. Either because of inability of the small bowel to push its contents into the colon on account of increasing cecal pressure, or an incompetency of the ileocecal valve, so that gas is backed into the small bowel, the ileum dilates. Unless attention is paid to the dilatation of the colon, an erroneous diagnosis of mechanical small bowel obstruction may be made. A barium enema should be given whenever there is doubt, since the procedure is harmless inasmuch as the flow of barium is distal to the obstruction (Figs. 22 and 23).

A slowly developing obstruction of the sigmoid, which is most always due to carcinoma, can be differentiated roentgenologically from an obstruction due to a volvulus (14). The difference in the findings is based on the fact that with a slow growing obstruction of the sigmoid the colon has a chance to accommodate itself to the increasing pressure. The cecum, having the thinnest wall and the largest diameter of any part of the colon, will



Figs. 24 and 25. Two cases of obstruction of colon by slow-growing carcinoma of sigmoid. Distention of colon to the sigmoid.

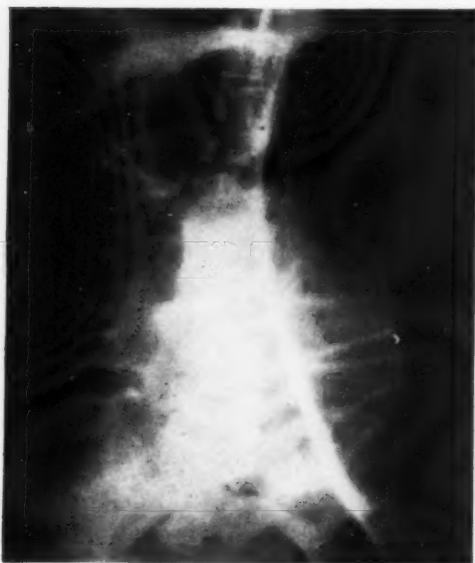


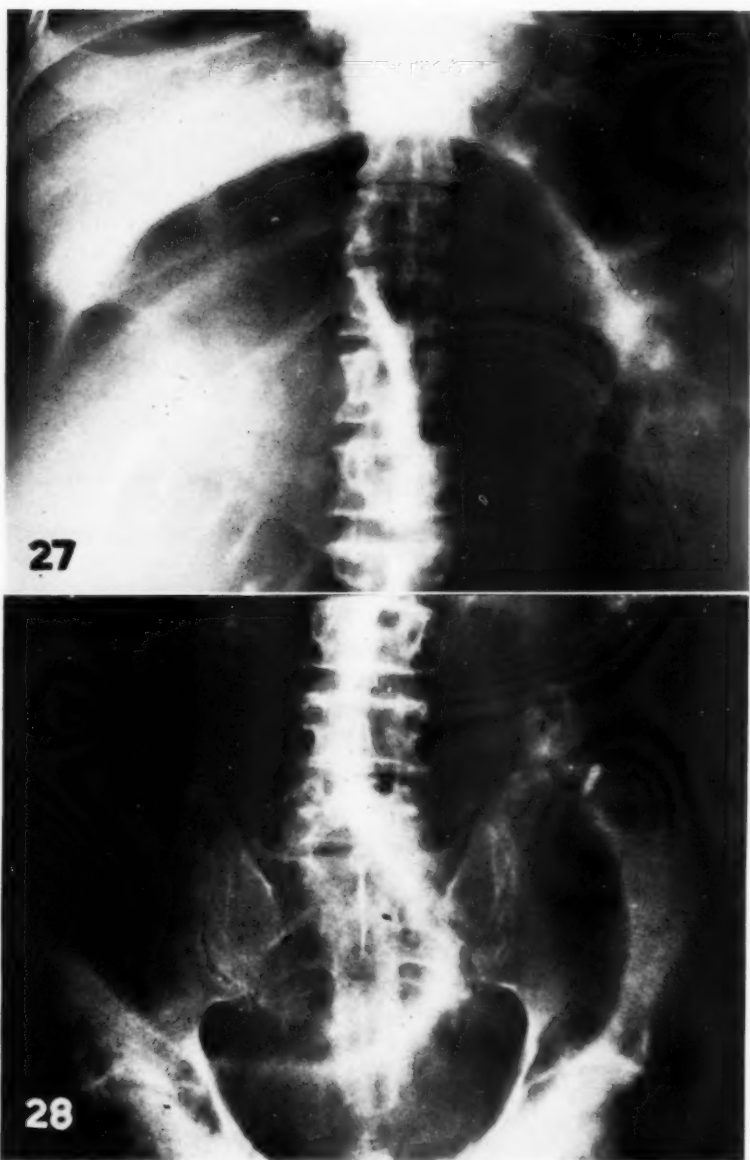
Fig. 26. Sudden obstruction of colon as a result of volvulus of sigmoid. Markedly distended sigmoid rising out of the pelvis, lying in the middle of the abdomen, extending to the diaphragm.

show the earliest and the greatest distention. It may even be distended to the point of perforation (15). The obstruction may be slowly progressive, producing

intermittent right-sided distress and it may make itself evident by suddenly becoming complete. The patient then becomes acutely ill, with pain, distention, and all the symptoms of an acute obstruction. Films of the abdomen at this time show distention of the colon to the point of obstruction (Figs. 24 and 25).

A volvulus of the sigmoid also causes a sudden attack of pain and distention. The twisted loop is suddenly distended to a marked degree. The proximal colon is at first normal; later it, too, becomes distended as a result of mechanical block by the volvulus. Early the distention is limited to the involved loop. The largest distended loops of bowel have been encountered with a volvulus. The single loop may fill the abdomen. The x-ray appearance of the distended sigmoid differs from that of the slowly developing obstruction. The volvulus is seen on the film as a dilated gas-filled loop of bowel rising out of the pelvis and lying in the middle of the abdomen (Figs. 26-28.) The distended colon due to a gradual obstruction of the sigmoid lies in the usual position for the colon and can be traced

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Figs. 27 and 28. Sudden obstruction of colon as a result of volvulus of sigmoid. Marked distention of sigmoid. The whole abdomen could not be taken on a single film. A large loop of distended bowel rises out of the pelvis, lying in the middle of the abdomen, extending to the diaphragm.

from the point of obstruction to the cecum. The ability to distinguish between the two types of obstruction is most important to the surgeon. If the distention is due to an obstruction of the sigmoid, a decompression of the bowel by a cecostomy may be

the procedure of choice. The right-sided incision required in this instance is obviously not satisfactory for reduction of a volvulus.

Gangrenous Bowel: Gangrene of the bowel is the one situation where a grave

condition may be present in the abdomen and the x-ray findings be not only disappointing but misleading. Among the causes of gangrenous bowel are mesenteric thrombosis, mechanical obstruction, strangulation of the vascular supply by volvulus, unreduced hernia, and intussusception. Some have reported changes demonstrable by x-ray in strangulation. Hintze (16) states that if an entire coil of small intestine is shut off from the intestinal tract, and the ends are strangulated, the coil will become greatly dilated by gas. Laurell (17) likewise has found typical pictures of intestinal obstruction in embolism and thrombosis of the mesenteric vessels. That has not been my experience or the experience of others (18). It may be that these cases where nothing was found were seen late in the course of the strangulation and that, if films had been taken early, some evidence might have been present. In five cases of gangrenous bowel examined, the involved loop was filled with fluid, but no gas was present, and there was no proximal distention. Although no peristalsis was present in the gangrenous bowel, there was no obstruction to the flow of fluid. The negative x-ray findings—no distention or ileus—may mislead the surgeon into the belief that all is well in the abdomen and operation may be delayed.

From a practical clinical point of view, how much can we tell the surgeon from the scout films that he does not already know, and how great a difference will this make in the procedure employed?

The best indication of the value of the findings on the abdominal film to the surgeon is his increased demand for this examination once the roentgenologist has proved its value and shown a willingness to co-operate. Where the making of an abdominal film was formerly a rare occasion at this hospital, it has now become almost routine for the acute surgical abdominal case. In a previously reported follow-up series (4) it was found that every diagnosis made by x-ray of mechanical ob-

struction was substantiated by surgery, while in no case which was diagnosed roentgenologically as paralytic ileus was mechanical obstruction proved by surgery or the subsequent clinical course.

We may not always be able to tell the nature of the lesion or cause of an obstruction, but we can tell whether an abdomen requires surgical intervention and, as in the case of volvulus, where best to make a surgical approach. A negative diagnosis of paralytic ileus may cause one to look further for the cause of the abdominal pain, as in one case in which additional questioning revealed a history of a black widow spider bite.

Many of the conditions discussed above can exist without x-ray evidence. It may even be necessary to make repeated examinations. Cases with a normal picture on one day have shown a typical mechanical obstruction on the next. The absence of x-ray findings, however, should not discourage the use of this type of examination but should stimulate one to find out why certain signs were not present. The evidence may be there, and the interpretation wrong. Only thus can we add to our information.

Valuable information is present on the "scout film," which requires study and careful interpretation in co-operation with the surgeon. The time spent by the roentgenologist is well rewarded by the growing respect and increasing demand for his opinion by his surgical colleagues.

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Emptying of the Normal Gallbladder with Priodax¹

LT. COL. BENJAMIN COPLEMAN, M.C., A.U.S.

FOLLOWING visualization of the gallbladder, we have routinely examined the patient at fifteen and thirty minutes after the ingestion of a fat meal² in order to study the contraction phase and, if possible, to demonstrate the cystic and the common ducts. This method is considered by Sussman (11) of greater importance than the mere determination of the gallbladder emptying time, since "a demonstration of a normal cystic and common duct provides a valuable confirmation of a normal function of the gallbladder and the sphincter of Oddi." Definite visualization of the hepatic ducts has also been accomplished by this method and has been interpreted as an indication of biliary dyskinesia (1, 3). The small size of the gallbladder, after partial emptying has occurred, often helps to bring into prominence small stones whose shadows might otherwise be obscured.

With the use of tetraiodophthalein, contractions of the gallbladder after the fat meal occurred promptly and vigorously, so that in over half of the normal cases the cystic and common ducts could be visualized.

During the past two years several articles have appeared on the use of a new substance, Priodax, for visualization of the gallbladder, but few of these mention a study of the emptying gallbladder. Einsel and Einsel (5) stated that most of the gallbladders examined with Priodax emptied 60 per cent in two hours. They noticed that the emptying process was more gradual than with tetraiodophthalein. Marshall (9) found "insufficient contraction, *i.e.*, poor function" in 8 of 50 cases examined two hours after the ingestion of a fat-protein meal. Bryan and Pedersen (2), who examined their patients thirty minutes

after a synthetic fat meal, found 73 per cent of a series of 845 to have normal gallbladders of average size, shape, and concentration, emptying over 50 per cent of their contents after the fatty meal. Hefke (6), who examined his patients forty-five minutes after the ingestion of 4 ounces of cream, also believes that the change in size of the gallbladder is of great aid in the diagnosis of stones. He will, on occasion, give a patient a second fat meal, not to achieve a certain degree of emptying, but to help further the differentiation between stones and gas shadows. None of the others who have written about Priodax has remarked on the changes in emptying (4, 7, 8, 10, 12, 13).

With the introduction of Priodax at this hospital, it was found almost immediately that visualization of the ducts had become uncommon, and emptying appeared to be prolonged. The impression was gained that, with comparable amounts of the opaque materials, the gallbladder became larger with Priodax than with tetraiodophthalein, that the emptying time was increased considerably and in many instances emptying was incomplete.

In order to test this impression, 5 patients were examined with Priodax and a few days later were re-examined with tetraiodophthalein. Another series of 5 patients was examined with tetraiodophthalein and a few days later with Priodax. Since we had previously been obtaining the most consistent cholecystographic results with 10 gm. of tetraiodophthalein given in two doses, we used the nearest multiple of Priodax packages, each of which contains 3 gm., to obtain a dose of 9 gm. for comparison. The patients were not selected except that their first cholecystographic examination was normal.

¹ From the Roentgenologic Service of Lovell General Hospital, Fort Devens, Mass. Accepted for publication in August 1945.

² Two eggs in 8 oz. of a mixture of milk and thin cream, half and half, with sugar added to taste.

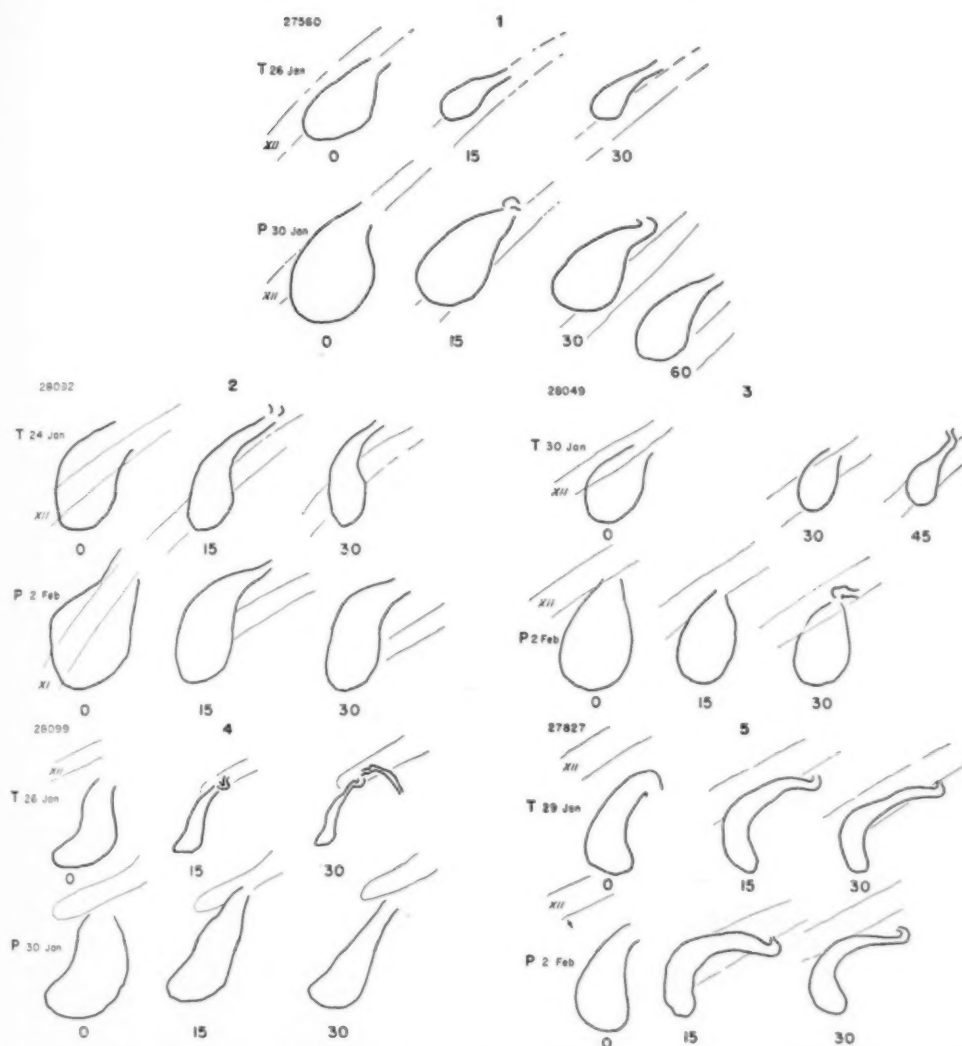


Fig. 1. Gallbladders of five patients first examined after ingestion of 10 gm. of tetraiodophthalein, and, again, from two to six days later, after the ingestion of 9 gm. of Priodax. The Priodax-filled gallbladders are larger and emptying is slower.

All of the patients were examined under identical conditions of technic, so that the size of the gallbladder shadows was comparable. The outlines of the gallbladders were traced on onion-skin paper, the lines were inked in, and all of the tracings of the same series were mounted on one sheet of paper and photographed. The other series was prepared in the same way and photographed with the same factors.

The cases which were given the tetraiodophthalein first are shown in Figure 1. From three to six days later the examination was repeated with Priodax. The Priodax-filled gallbladders before the administration of the fat meal are consistently larger. Emptying was definitely slower with Priodax.

In Figure 2 are shown the gallbladders of the patients who were first given Prio-

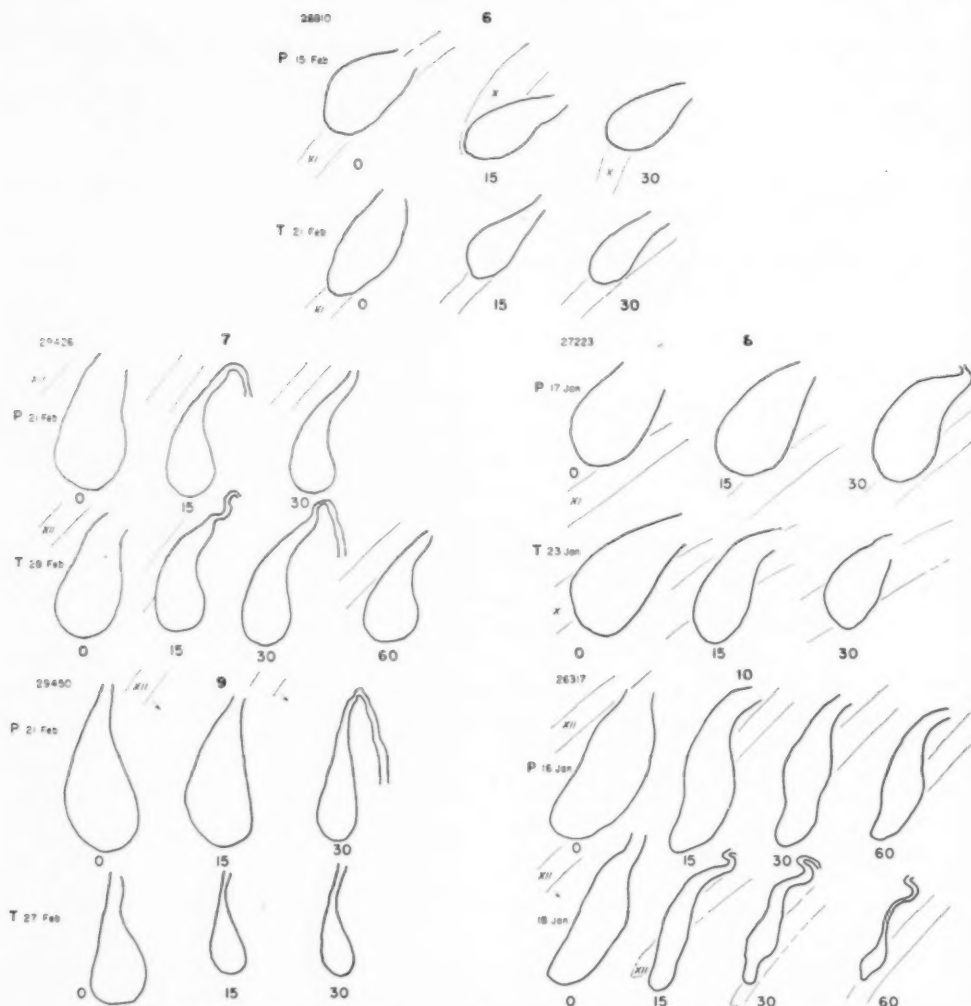


Fig. 2. Gallbladders of five patients first examined after ingestion of 9 gm. of Priodax, and, again, from two to six days later, after ingestion of 10 gm. of tetraiodophthalein. Except for Case 7, the Priodax-filled gallbladders are larger and emptying is slower.

dax, and, from two to six days later, were re-examined after the ingestion of tetraiodophthalein. In Case 7 the emptying is generally equal for both drugs, but here again before the administration of the fat meal the Priodax-filled viscus is the larger. In Case 8 the gallbladder remains about the same size with each drug, although emptying is clearly more rapid with tetraiodophthalein.

Case 11 (Fig. 3) was first examined with Priodax and then with tetraiodophthalein.

The difference in response was so great that the examination was again performed with Priodax. The difference in size, including the filled resting stage before the fat meal, following tetraiodophthalein and the second series of Priodax was still marked.

It will be observed that the gallbladder in the second Priodax series was smaller than in the first, as though the tetraiodophthalein had increased the tonus of the organ. In the two series of patients (Figs. 1

and 2) the Priodax-filled gallbladders were comparable in size whether or not tetraiodophthalein had been given first. The findings in Case 11 are of interest, since it lends some support to the impression that Priodax suppresses gallbladder contraction and tonus.

It should be remarked that good contraction need not result in good visualization of the ducts (Case 9, Fig. 2), but a failure of adequate emptying will surely decrease the incidence of such demonstrations.

DISCUSSIONS

Too little attention is generally paid to gallbladder emptying. The importance of the contraction phase does not lie in the determination of the emptying time, but in the aid which it may give in the study of a group of patients whose gallbladders are well visualized but in whom there may be definite abnormality in the emptying mechanism, with the production of symptoms. A study of the contraction phase may also give valuable aid in the diagnosis of small stones.

The use of Priodax has adversely influenced the study of this phase because of the relaxation of gallbladder tonus. The action appears similar to that of a sympathicomimetic drug in that, compared with tetraiodophthalein, it relaxes the gallbladder. We have attempted to overcome this by administering a mixture of Priodax and tetraiodophthalein but, since no advantage was found, we have returned to the use of tetraiodophthalein.

CONCLUSIONS

1. When the gallbladder is visualized with tetraiodophthalein, a fat meal usually produces prompt and vigorous emptying in the normal case. In more than half of the cases without stones, the cystic and common ducts may be visualized. In a small number of cases the demonstration of the hepatic duct or even its radicles may aid in the diagnosis of biliary dyskinesia. The decrease in size of the gallbladder also helps

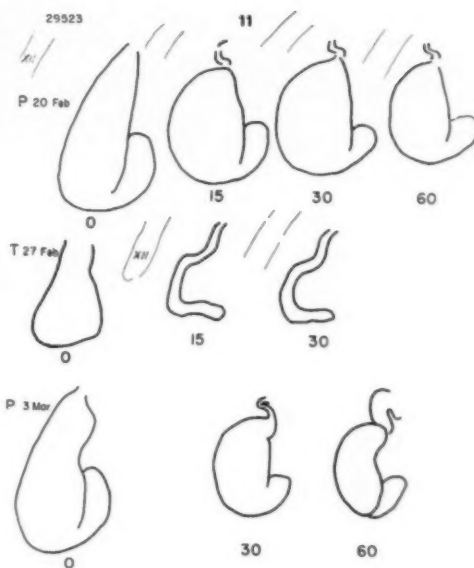


Fig. 3. In this case the marked difference in response to Priodax and tetraiodophthalein prompted a re-examination with Priodax. The difference in size of the gallbladder with the tetraiodophthalein and the second series with Priodax is again striking. The size of the gallbladder in the second Priodax series is smaller than in the first, as though tetraiodophthalein had increased the gallbladder tonus in the interim.

in the differential diagnosis between gas shadows and small non-opaque stones.

2. Priodax, a new drug, while producing a dense gallbladder shadow, appears to interfere with gallbladder emptying and the visualization of the bile ducts. In comparison with tetraiodophthalein, Priodax acts like a sympathicomimetic drug.

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Pantopaque Myelography: Diagnostic

Errors and Review of Cases¹

LT. COL. GEORGE L. MALTBY, M.C., A.U.S., and LT. COL. ROBERT C. PENDERGRASS, M.C., A.U.S.

NUMEROUS articles dealing with the use of Pantopaque in myelography have appeared in the medical literature in the past three years. While the more typical myelographic pictures due to rupture of the nucleus pulposus are easily recognizable, one occasionally encounters bizarre patterns whose interpretation is difficult. We wish to present some of these unusual patterns, to discuss common sources of error in diagnosis, and to review 215 Pantopaque myelograms. Of the 215 cases examined, 69 came to operation, and the myelographic findings will be compared with the preoperative diagnosis.

TECHNIC

Site of Injection: In myelography for detection of a protruded disk in the lumbar region, the needle should not be introduced at the level of the suspected protrusion, since removal of the oil may be more difficult and defects due to the needle may resemble those due to a protruded disk. If we encounter a defect at the site of introduction of the needle, it is our practice to remove it, continue the fluoroscopic and radiographic examination, and then re-insert the needle for withdrawal of the oil. (See Figs. 9 and 10.)

Fluoroscopic Study: Careful fluoroscopic observation is just as essential in Pantopaque myelography as in examination of the gastro-intestinal tract. Slowing of the oil column, its passage over an apparent partial obstruction or hump, and study of the side on which the narrowed column of oil ascends or descends are all valuable in forming final conclusions (Fig. 5, B). All studies are carried out jointly by members of the neurosurgical and roentgenologic staffs. Spot films are made as indi-

cated; it is our usual practice to make two exposures of each level where the oil is observed, to check the constancy of defects.

Equipment: The ideal table for fluoroscopic use is one which permits at least a 40° tilt in the reverse Trendelenburg position and full upright tilt. A limited range of excursion may be remedied by removing the curved head from the bottom of the table, substituting protective side panels, and installing a shock-proof fluoroscopic tube with cables. This will usually permit from 20 to 30° additional tilt toward the head. The gears on the average table are not constructed to permit this. Additional spacings may be cut in the ones already supplied.

Spot-Film Device: While any spot-film device permitting rapid exposures may be used, we prefer to use one which provides two exposures on one 8 × 10-in. film. Our device embodies a quick change switch from fluoroscopic to radiographic current and was locally constructed. Any such device must be provided with a protective brace which will prevent the screen and spot-film device from falling on the spinal puncture needle. Figure 13 shows such a device with a protective support. This support is readily adjustable for patients of varying thickness.

Amount of Oil Used: The amount of Pantopaque customarily employed is 3 c.c. Recently, we have used 5 and 6 c.c. in several instances. We believe that the additional amount is of advantage (1) for better filling of what is apparently a narrowed canal, (2) for better filling of the caudal sac, and (3) for the simultaneous visualization of several interspaces (Fig. 12).

¹ From the Neurosurgical and Roentgenological Services, Ashford General Hospital, White Sulphur Springs, W. Va. Accepted for publication in August 1945. Read by title at the Thirty-first Annual Meeting of the Radiological Society of North America, Chicago, Ill., Nov. 9-10, 1945.

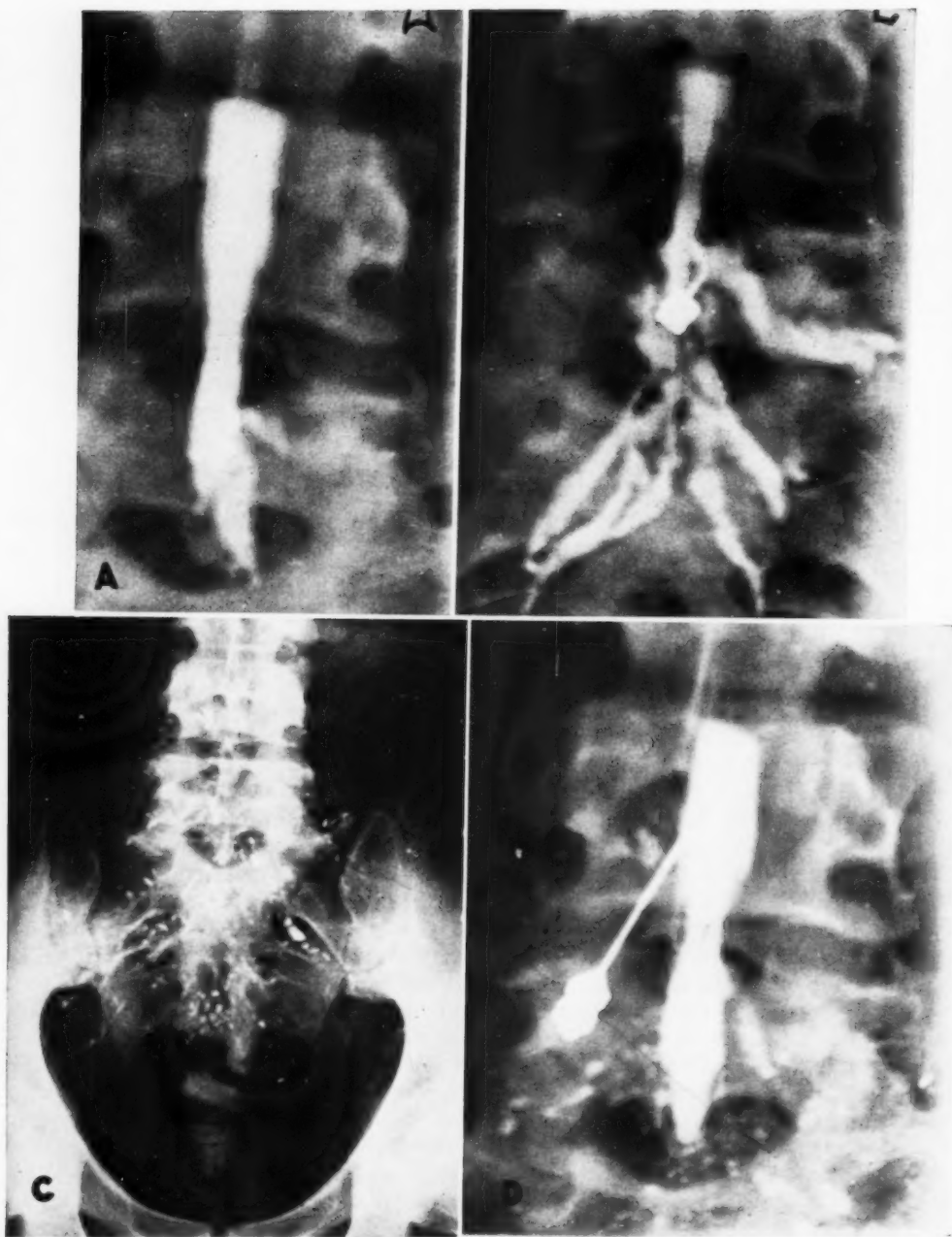


Fig. 1. Extra-arachnoid escape of oil. A. Oil injected in arachnoid space with beginning escape along nerve roots. B. Wide distribution of oil along nerve sheaths, with patient in vertical position. C. Film two weeks later, showing oil along course of sacral and sciatic nerves. D. Repeat myelogram showing disk defect at L4-5 left. Confirmed.

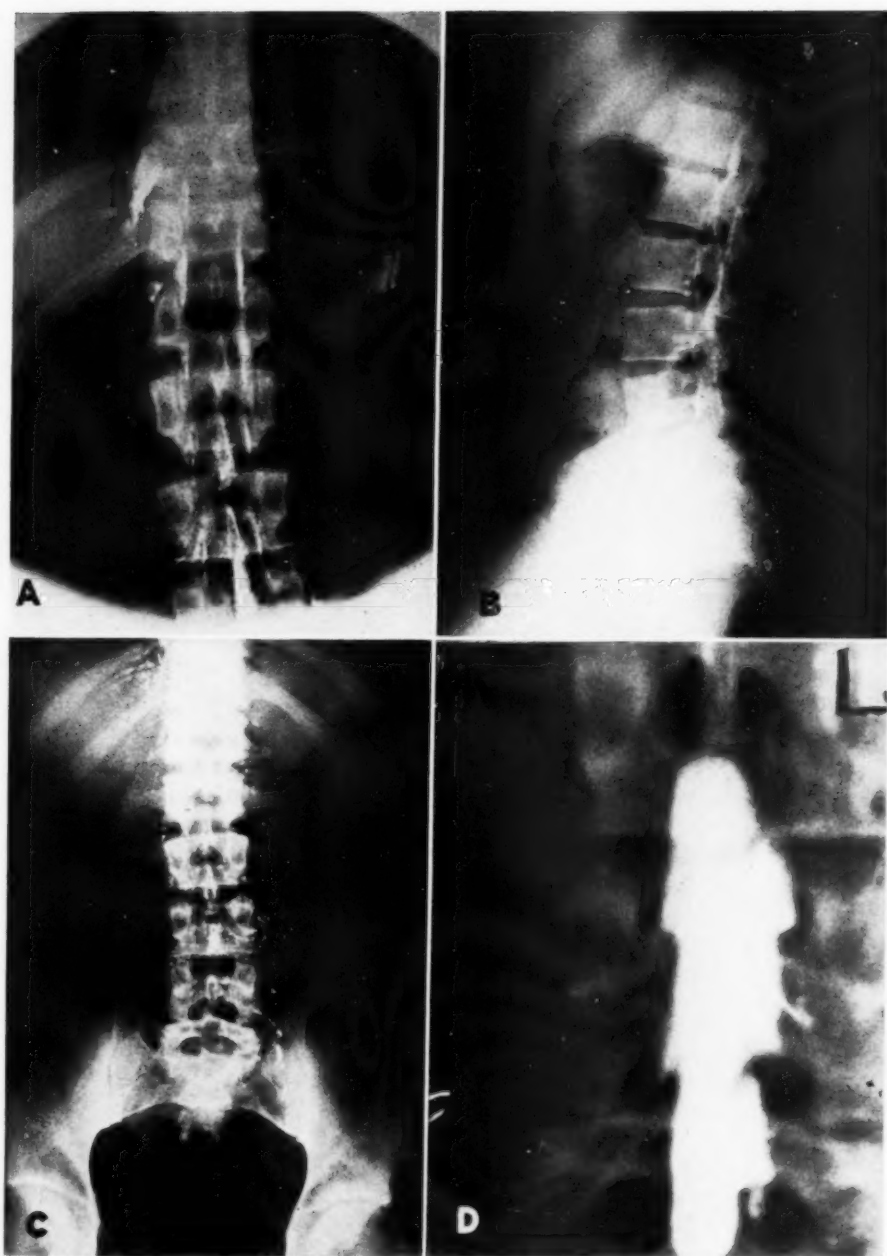


Fig. 2. Oil injection following easy aspiration of spinal fluid. A. Oil apparently in arachnoid space at L3-4, but extra-arachnoid oil in two parallel columns with escape laterally at D11-12 and D12-L1. B. Lateral view, showing extra-arachnoid distribution of oil. Oil beneath needle point is also extra-arachnoid. C. Film nine days later, showing distribution of oil along nerve roots with some absorption. D. Repeat myelogram, showing defect at L5-S1 left. Interpreted as disk defect, but found to be due to dilated veins.

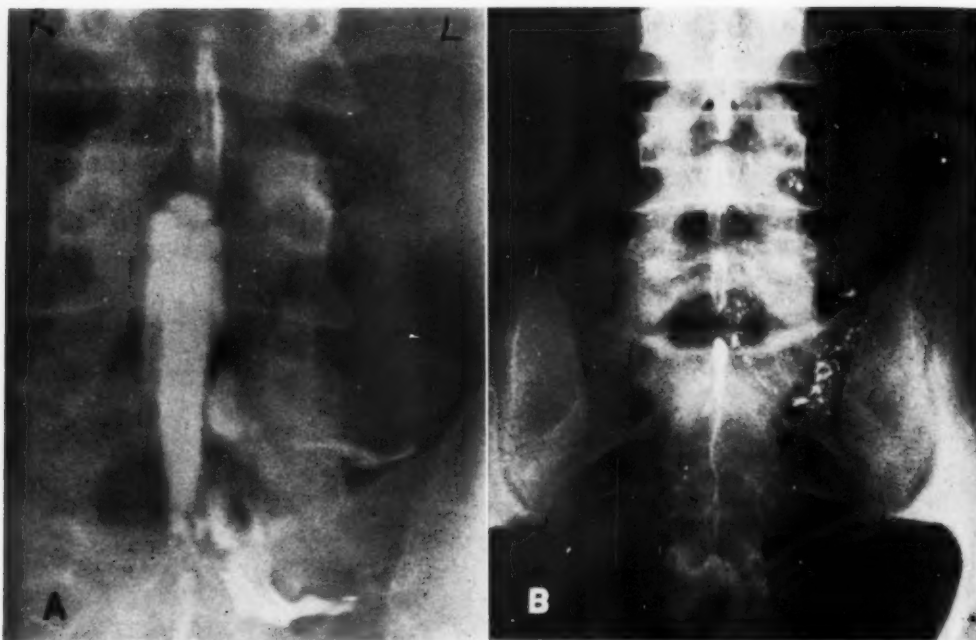


Fig. 3. A. Oil in arachnoid space and along 4th and 5th lumbar roots, left. B. Film one week later. Oil in arachnoid space has been aspirated but escaped oil remains along nerve roots.

INTERPRETATION

At this hospital myelographic reports are given by the roentgenologic service on the basis of the findings on fluoroscopic and film examination alone. These reports are then correlated with the history and clinical findings, with special reference to neurological manifestations, at a joint conference between members of the roentgenologic and neurosurgical services. Review of the history and physical findings prior to the myelography may bias the opinion of the roentgenologist. In the summary of the cases to be presented later in this article, discrepancies will be noted between the diagnoses of the roentgenologic staff, the clinical opinion of the neurosurgeon, and the operative findings. In many instances the roentgenologic service has made a report in which certain defects in the oil column or filling of the root sleeves were noted. The statement is often made: "These findings are suspicious of ruptured disk, but correlation with the clinical

findings will be necessary for a final diagnosis." Such a report is rendered not in a spirit of evasion but with the feeling that only by the correlation of all available evidence can a definite diagnosis be reached in many instances. The roentgenologic reports are made by various members of the staff, with varying experience in Pantopaque myelography. It is therefore felt that the findings described in this report may be somewhat typical of those in the average Army hospital, and may approach results achieved by different examiners in civilian practice.

SOURCES OF ERROR

Extra-Arachnoid Injection of Oil: Injection of oil outside the arachnoid space has occurred in the hands of members of the neurosurgical staff with varying amounts of experience. When one considers the small distance between the subarachnoid space and the subdural space, it is not surprising that extra-arachnoid injection of oil may very easily occur. In many

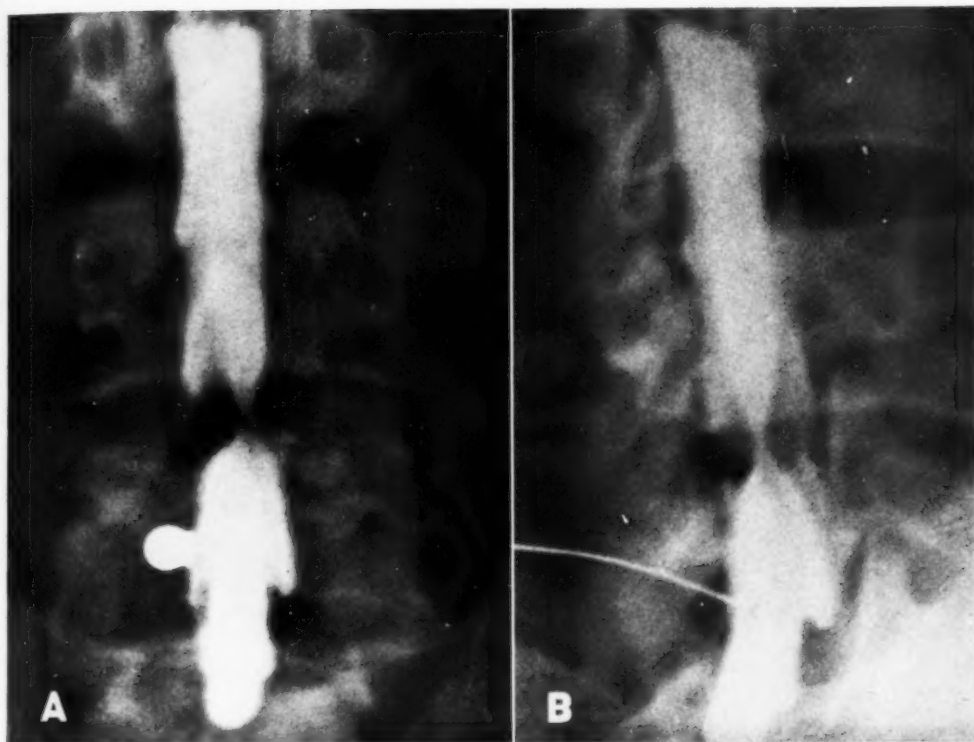


Fig. 4. A. Large defect on right at L4-5 with linear extensions into oil column overlying L3-4. B. Oblique view, showing narrowing of oil column and linear streaking. Linear defects found to be due to dilated veins; narrowing of column due to ruptured disk.

instances the oil has been seen to escape into the subdural and extradural spaces even though spinal fluid was withdrawn without difficulty and no bleeding was encountered. The pattern produced by injection of oil outside the arachnoid space varies widely. In some instances it is represented by two parallel columns of oil with an unfilled center, somewhat similar to the pattern found in intramedullary tumors (Fig. 2). In other instances the oil has been seen to escape through the foramina and apparently along the course of the lumbar and sacral nerves immediately after injection (Fig. 3). This rapid escape of oil along the nerve roots seems to indicate passage through pre-existing channels rather than slow migration by way of the lymphatics.

One must recognize the patterns pro-

duced by subdural and epidural injection of oil in order that a false diagnosis of tumor, arachnoiditis, etc., will not be made. Oil injected in the 4th lumbar interspace often rapidly reaches the lower thoracic region, as illustrated in Figure 1, A.

It would appear that the extent of the arachnoid spaces and the dural sheaths outside the spinal canal is quite variable, if one is to judge by the manner in which oil is occasionally found distributed. Further study is indicated to determine the extent of the arachnoid and dura outside the vertebral canal. We have attempted to study this space by injection of oil in the subdural space at autopsy, but the findings to date are somewhat inconclusive, and it is planned to conduct further investigation along this line.

Centrally Protruded Disk: Central pro-

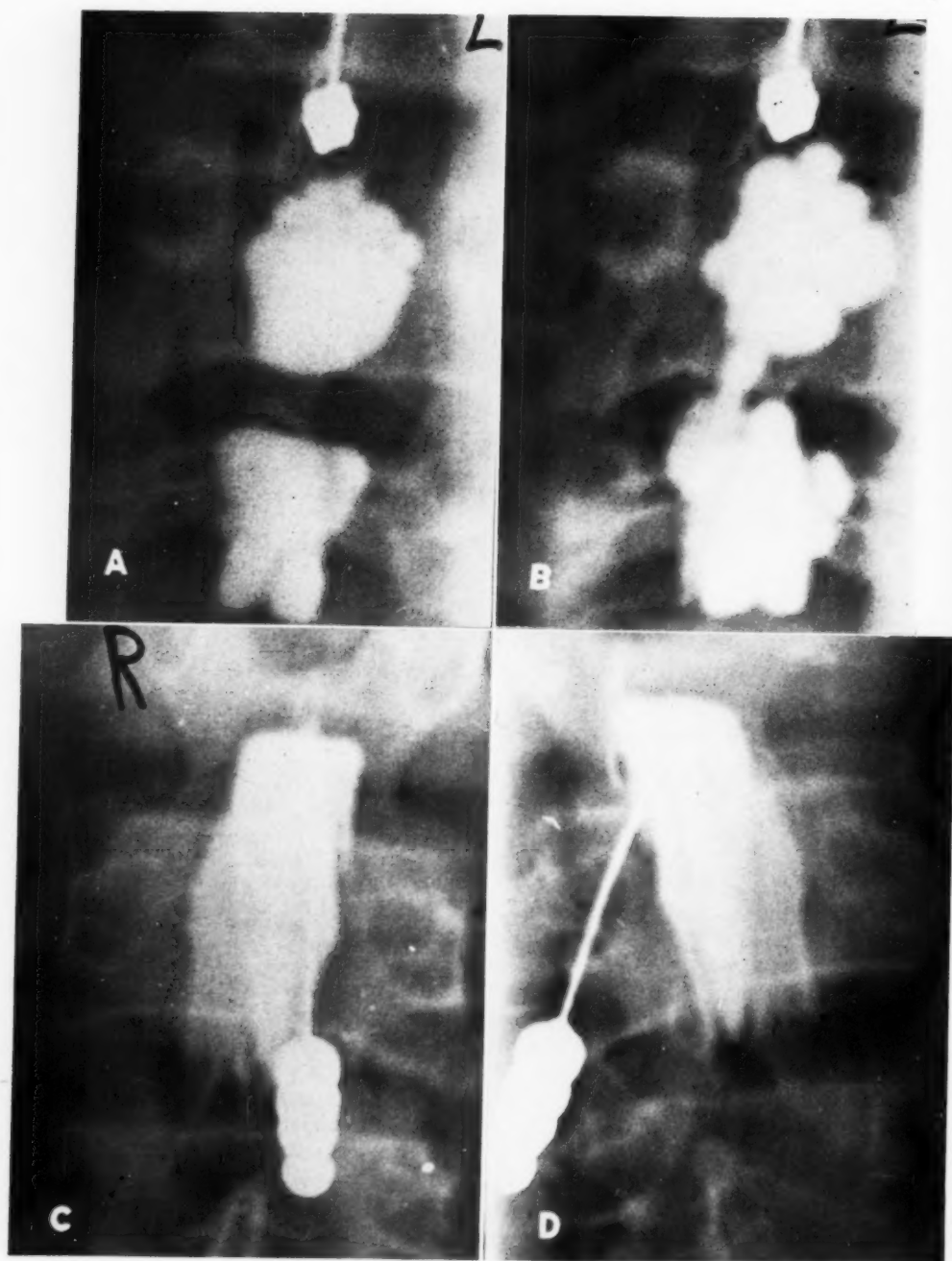


Fig. 5. A. Apparent complete division of oil column. Clinical symptoms of paraplegia suggesting cauda equina tumor. Large ruptured disk found at operation. B. Same case showing oil trickling through on right and joining two oil masses. C. Block at L3-4 with feathered lower border of oil column. Long history suggesting cauda equina tumor. D. Oblique view of same case. Operation disclosed large ruptured disk and localized arachnoiditis.



Fig. 6. A. Narrow canal with lateral defects at L3-4 and L4-5, with obliteration of root sleeves. B. Oblique view, showing defects at L3-4 and L4-5. Operation revealed protruded disks at both interspaces, with root compression.

trusion of the disk may fail to produce any lateral deformities of the oil column, but the column may appear to be thinned overlying the disk. This fact has been ably discussed by Copleman (3) and more recently by Soule, Gross, and Irving (8). Our experience is in accord with theirs.

Arachnoid Block: French and Payne (6) reported eight cases with cauda equina injury and complete blockage in association with ruptured intervertebral disks. We have observed two such cases in our series. Distinction from tumor may not be easy. In one case, in addition to a protruded disk there was a localized arachnoiditis (Fig. 5, C and D).

Varices: The myelographic pattern of varices of the cord has been described by several writers. We have observed two cases of very definite lateral defects of the central oil column produced by varices. Further study of the films has shown linear extensions of the deformity into the central oil column, which are not usually noted in the presence of a protruded disk. When-

ever this pattern is encountered, one should be suspicious of the presence of varices, although the coexistence of a ruptured disk or tumor cannot be ruled out (Fig. 4).

Adhesions: We have had occasion to do myelography on patients from whom a ruptured disk had previously been removed, who had symptoms suggestive of recurrence. The myelograms showed irregular deformity of the oil column. At operation, extensive scar tissue was found, producing pressure on the nerve roots, but no recurrent disk rupture. These cases present one of the most difficult diagnostic problems.

Epidural Abscess: Figure 11 shows a rather unusual myelographic pattern obtained in a patient who had previously had a disk removed elsewhere. It was felt that a portion of the oil might lie epidurally, or that there might be extensive arachnoiditis or scarring following surgery. Operation disclosed an epidural abscess.

Narrow Oil Column: As has been men-

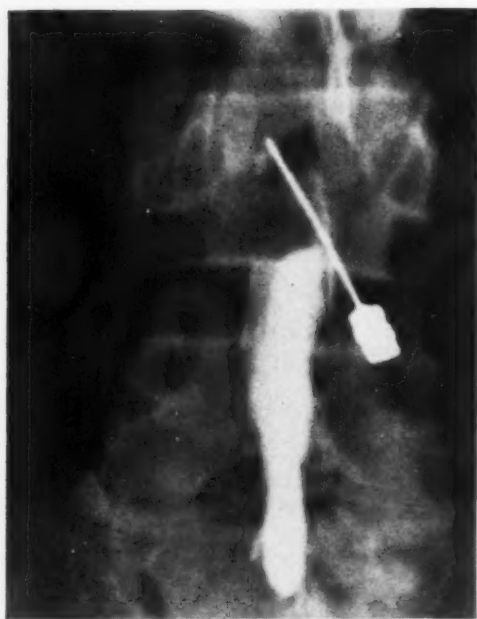


Fig. 7. Narrow canal with shallow lateral defect at L5-S1 right. Large ruptured disk found at operation.

tioned by Camp (2), Soule *et al.* (8), Arbuckle, Shelden, and Pudenz (1), if the oil column is less than 16 mm. in width, the protruded disk may not produce any defect demonstrable in the myelogram. We again wish to call attention to the advisability of using a large amount of oil to fill out what is apparently a narrow arachnoid space where this condition is encountered.

Non-Filling or Incomplete Filling of the Root Sleeves: The filling of root sleeves by Pantopaque is so variable that we do not feel that a definite diagnosis can be based upon non-filling alone. However, good filling on one side, associated with poor filling on the other, or absence of filling, constitutes evidence suspicious of a ruptured disk. In cases where one root sleeve at a certain level filled well and the opposite one did not fill well, we have found that, if the patient was placed in a lateral position with the unfilled side down, it could often be satisfactorily filled. Fail-

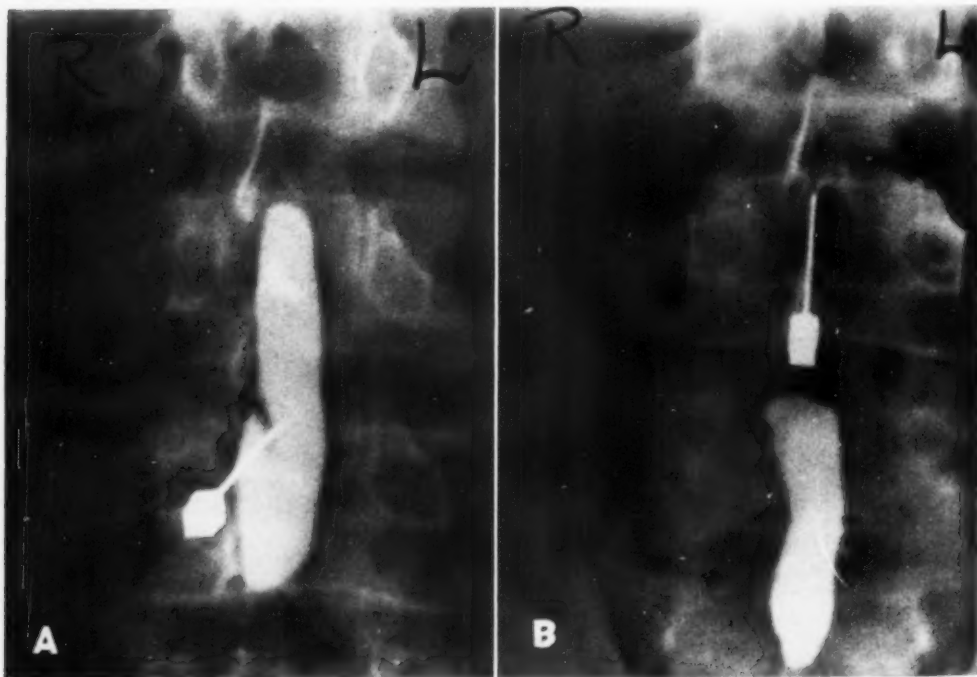


Fig. 8. A. Notching of oil column on right at L3-4. Obvious needle defect. B. Same case, with deflection of oil column to left by ruptured disk at L5-S1 right. Confirmed at operation.

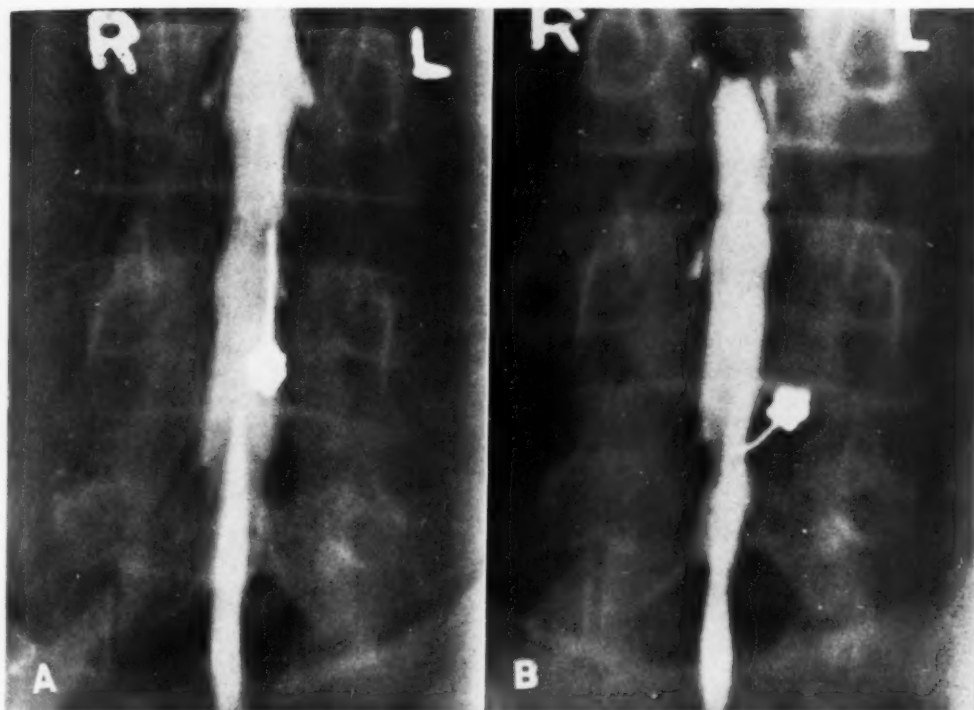


Fig. 9. A. Needle defect at L3-4 left; very narrow column at L5-S1. B. Needle re-inserted at L4-5; defect at L3-4 now absent. Shallow indentation of narrow column at L5-S1 left, due to large ruptured disk. Confirmed at operation.

ure to use this maneuver may result in false impressions. Epstein (5) called attention to the use of the Valsalva maneuver in the attempt to force oil into the root sleeves. We have not found this uniformly successful. While it was used routinely in several cases, it has now been abandoned. As mentioned by Scott and Furlow (7), however, the Valsalva maneuver (expiration with glottis closed) does provide a usually painless method of expelling the oil through the lumbar puncture needle after the examination is completed. This method is somewhat slower, as a rule, than aspiration, but it is more comfortable for the patient and is often just as effective. We usually attempt aspiration and, if that is not successful, resort to the Valsalva maneuver or have the patient cough several times.

In reference to technic and interpretation, we wish to emphasize that films of

good diagnostic quality are just as important in myelography as in any other roentgenologic study. Only by having films of good detail and sufficient contrast to show various oil densities can one obtain the maximum amount of information from the radiographs. A procedure such as myelography, which involves pre-operative preparation, spinal puncture, probable headache after spinal puncture, and effort and time on the part of the neurosurgeon and radiologist, should not be jeopardized by technically poor films.

REVIEW OF CASES

There were 215 instances in which the history, signs, and symptoms of a ruptured nucleus pulposus were such that the neurosurgical staff felt that myelography was indicated. In 107 patients the x-ray findings confirmed the clinical impression and showed changes compatible with a rup-

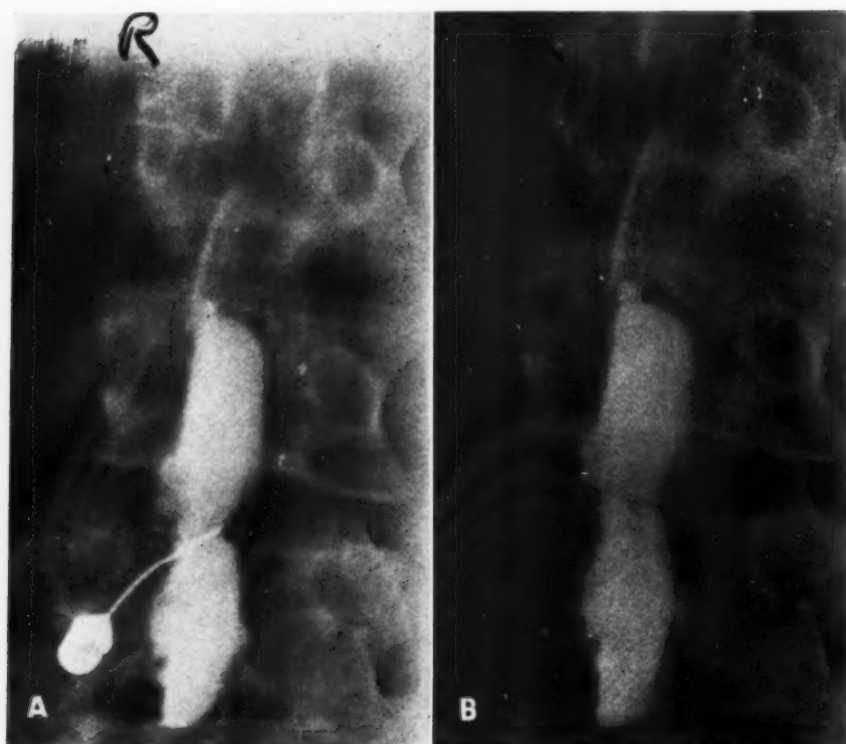


Fig. 10. A. Defect at needle point L4-5 left. B. Defect remains after removal of needle. Ruptured disk.

tured intervertebral disk. There were also 8 instances in which an abnormal myelogram could not be considered characteristic of a ruptured disk. This group will be discussed later.

Of the 107 patients with positive myelograms, 57 (53 per cent) were operated upon. Of these 57 patients, 51 (89.4 per cent) showed a disk lesion at operation. Six patients (10.6 per cent) had negative explorations. Nine patients with negative x-ray findings were operated upon, because of what seemed to be classical clinical findings of a ruptured disk. In 5 (56 per cent) of these 9 patients, the findings on exploration were negative, while 4 (44 per cent) were found to have a definite rupture of the nucleus pulposus.

It may be considered somewhat unusual that such a small proportion of this group were subjected to surgery. This fact may

be explained by the conservative point of view taken both by the Army Medical Department and this Neurosurgical Center as to the indications for surgical therapy of this condition in military personnel. Many patients in spite of positive findings, both clinical and roentgenologic, showed minimal disability and could be returned either to limited duty in the Army or to their civilian occupations without operative treatment.

The 8 abnormal myelograms mentioned above, which could not be considered characteristic of a ruptured disk, may be considered briefly. These were divided in respect to the x-ray diagnosis as follows:

Myelograms suspicious of ruptured disk but needing clinical confirmation.....	3
Arachnoiditis.....	1



Fig. 11. Myelogram following previous operation for disk. Bizarre central defect at L3-4, found at operation to be due to epidural abscess.

Postoperative scar tissue.....	1
Unsatisfactory, because of extra-arachnoid oil.....	1
Multiple filling defects, cause unknown.....	1
Block.....	1

Of the 8 patients, 3 came to operation. In the case labeled "postoperative scar tissue" a recurrent disk was found. The one diagnosed simply as "block" showed a small epidural abscess, and the one considered as "roentgenologically suspicious of a disk but needing clinical confirmation" showed a ruptured disk.

SUMMARY AND CONCLUSIONS

1. A study has been made of 215 consecutive lumbar myelograms in order to determine the sources of diagnostic error. Some of the errors are described and illustrated.
2. The technic of myelography is briefly reviewed, with suggestions as to apparatus to be employed.
3. The diagnostic and operative statis-

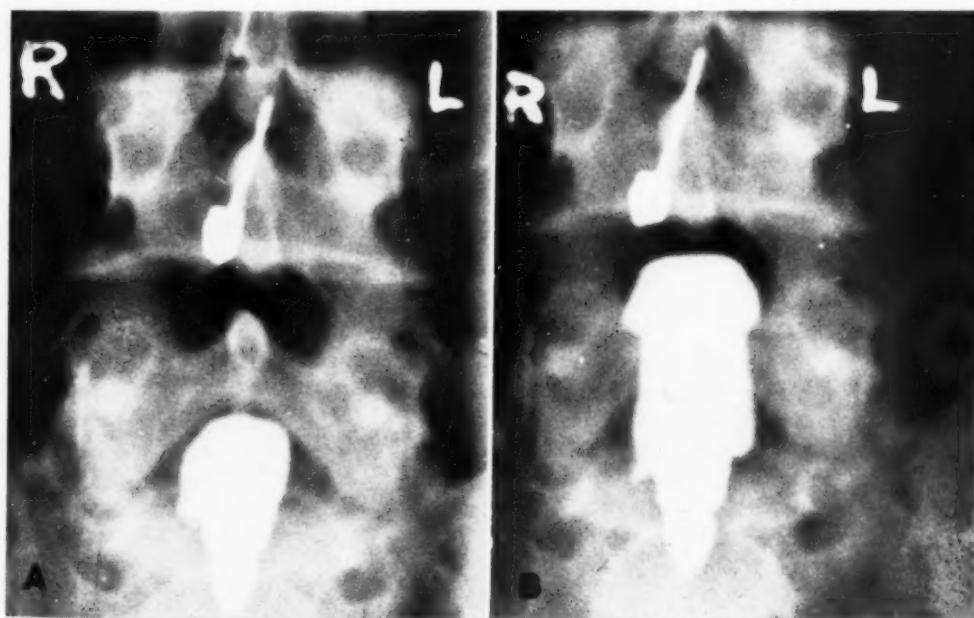


Fig. 12. A. Unfilled left root sleeve at L5-S1 with 3 c.c. of oil. B. Same case with 6 c.c. of oil, showing left root sleeve filled, but shorter than the right. Normal myelogram. No operation.

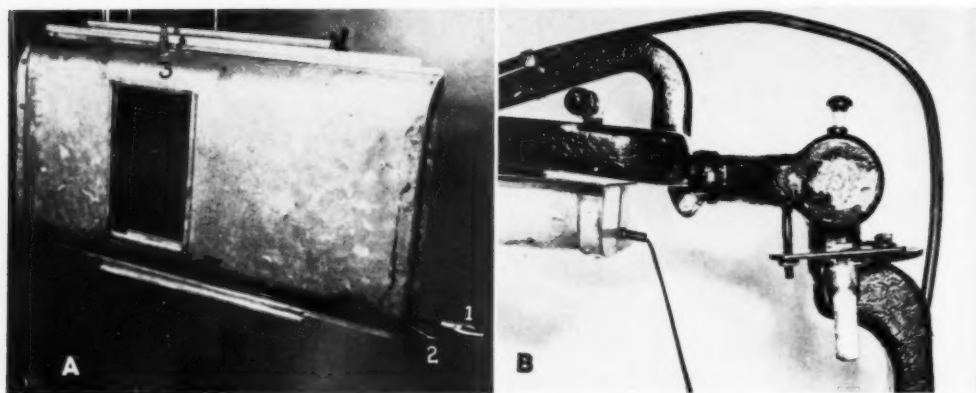


Fig. 13. A. Spot film device used in myelography and gastro-intestinal examinations, showing one half of 8×10 -inch cassette ready for exposure. 1. Bar with ring used to return cassette to fluoroscopic position and close fluoroscopic switch setting. 2. Trip lever used to throw half of cassette in radiographic position and close radiographic switch. 3. Lever to throw second half of cassette in radiographic position. B. Adjustable bracket to support fluoroscopic arm. Threaded bolt permits varying height of spot-film device for patients of different thickness.

tics in this group have been briefly summarized.

4. The roentgenologic interpretations were made by several observers and are believed to represent a fair cross section of such interpretations in Army hospitals.

5. We wish to emphasize the necessity of close correlation of the clinical and roentgenologic findings.

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Iodinated Organic Compounds as Contrast Media for Radiographic Diagnoses

V. Escape of Pantopaque from the Intracranial Subarachnoid Space of Dogs¹

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AFTER MYELOGRAPHY with oil-type contrast media, some of the opaque substance may be left in the spinal canal at the end of the examination. When Pantopaque was developed for myelography, it was reported that such residues were absorbed in a relatively short time (6). Clinical experience, however, has shown that there is great variability in the rate of absorption in man (4, 11), and it seemed desirable to study both pathways and mechanisms by which the medium is eliminated. In dogs this work has led to the discovery that the cribriform plate is permeable to Pantopaque, and that this pathway may be an important avenue for the escape of the medium from the subarachnoid space in lower orders.

Experimental demonstration of the permeability of the cribriform plate to Pantopaque is easily carried out in dogs by running the medium into the cranial cavities of an anesthetized animal in a prone position with its head down. Oil-type media of lower viscosity than Pantopaque pass through the plate even more readily, but more viscous media, such as lipiodol, do not seem to penetrate; emulsions of oil-type media also do not permeate the plate. After passing through the cribriform plate, Pantopaque follows along the tissues of the nasal cavities to the lymphatics of the head and finally collects in the lymph nodes of the head and neck. A series of roentgenograms showing the progressive extension of the medium is reproduced in Figure 1 (A-F). From these films it is apparent that extension also occurs along the cranial nerves to some extent.

Demonstration of the passage of Pantopaque through the cribriform plate is conveniently carried out with dogs under continuous Nembutal anesthesia. In a typical experiment, an animal weighing 20 kg. was placed in a prone position with its head down and its body elevated at an angle of about 15° to the horizontal. A cisternal puncture was made, 8 c.c. of spinal fluid aspirated, and 5 c.c. of Pantopaque introduced into the subarachnoid space. Under continuous anesthesia the dog was maintained with its head down for a period of six hours. Lateral and ventrodorsal roentgenograms taken at intervals showed that the medium passed rapidly through the cribriform plate after about two hours, although the rate may be a function of the degree of inclination of the animal. Complete visualization of the tissues of the nasal cavities and of the lymphatics of the head was obtained after five or six hours. The dog survived the experiment well and did not show any deleterious effects over an observation period of several months.

Similar experiments with lipiodol and with a 50 per cent aqueous emulsion of Pantopaque gave negative results. Ethyl iodophenylvalerate (3) and iodobenzene, media much less viscous than Pantopaque, in many ways gave superior visualization but were so toxic that they could not be employed for survival experiments.

In an earlier publication (6) on the experimental study of the rate of elimination of Pantopaque from the subarachnoid space of dogs, it was estimated that about 3 c.c. of the medium was absorbed in a year. The mechanism by which this ab-

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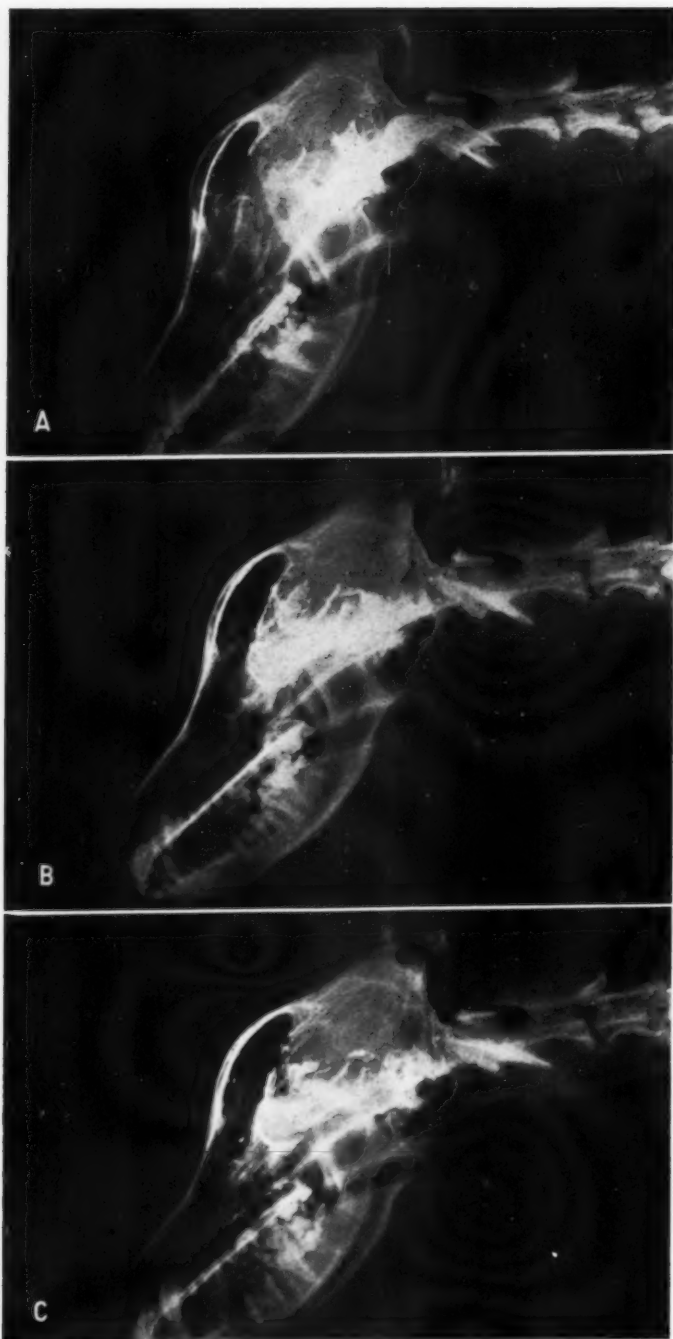


Fig. 1. Passage of Pantopaque through the cribriform plate of a dog.
 A. Position of the medium in the cranial cavities ten minutes after injection.
 B. Contact of the opaque ester with the cribriform plate 90 minutes after injection.
 C. Passage of Pantopaque through the cribriform plate and along the tissues of the nasal cavities 210 minutes after injection.

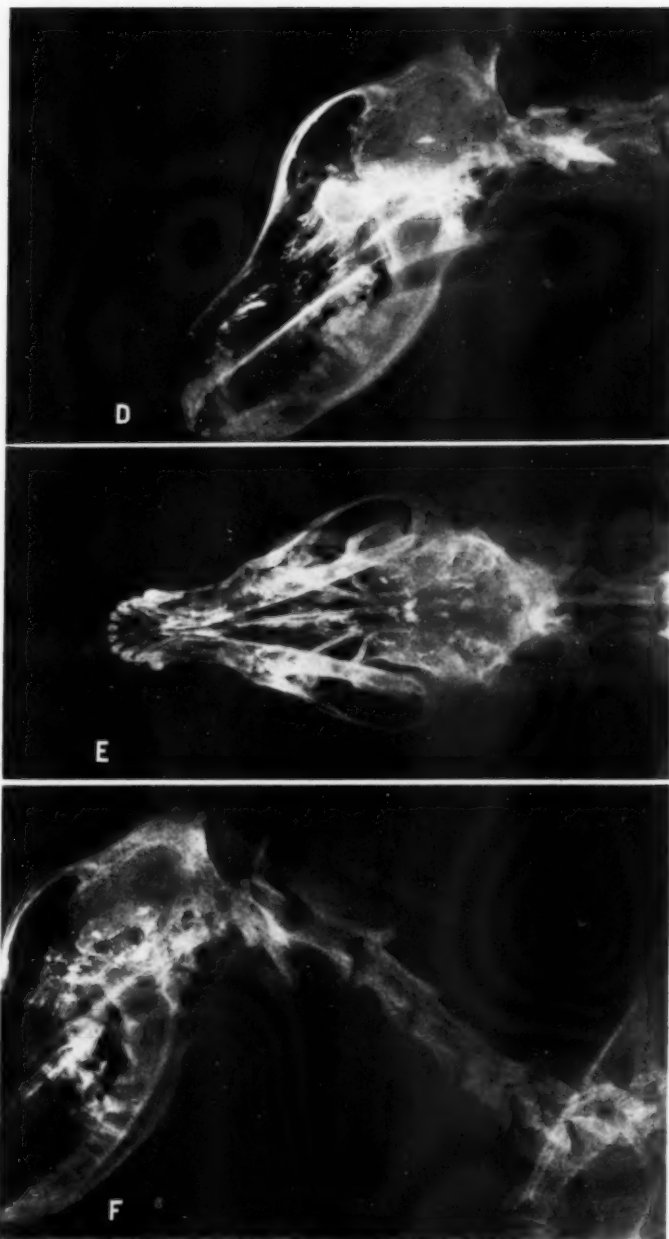


Fig. 1. D. Visualization of a number of lymphatics as well as the tissues of the nasal cavities 390 minutes after injection. E. Dorsoventral view showing visualization of the optic nerves 390 minutes after injection. The medium may be present in the so-called perineural spaces. F. Roentgenogram taken two days after the injection; note the small amount of Pantopaque remaining in the cranial cavities and the accumulation of opaque medium in the lymph nodes of the head and neck.

Roentgenograms A-E were made while the dog was under continuous anesthesia, the body in a prone position, and the head dependent. Following recovery from anesthesia the animal was in excellent condition, and has shown no deleterious effects during an observation period of several months.

sorption occurs is unknown. It has been observed that there is great variation among dogs in the rate of absorption of the medium. The explanation of this variability may be that in some animals a substantial portion of the medium enters the intracranial cavities and passes out through the cribriform plate.

Clinically, the rate of absorption of Pantopaque appears to be of the order of 0.5-1.0 c.c. per year (4, 11), with exceptional cases where the medium disappears from the subarachnoid space with some rapidity. It seems improbable that elimination through the cribriform plate can play an important role in man because of the postural differences between man and quadrupeds. Indeed, it does not follow from the animal experiments reported here that Pantopaque can pass through the cribriform plate in man. There is the possibility that the medium may be absorbed *via* the spaces about the peripheral nerves. To date there is no evidence supporting such an hypothesis, even though in a number of instances the opaque medium has followed along the nerve sheaths or nerves for a considerable distance.

The demonstration of the connection between the subarachnoid space and the lymphatics of the head *via* the cribriform plate and the tissues of the nasal cavities is not new; it has been carried out previously by several methods. Among such procedures, those in which electrolytes have been employed are well summarized by Weed (8, 9), and others, in which particulate matter such as India ink have been used, are reviewed and extended by Speransky (7); additional data have been collected by Rouvière (5). Roentgenographic methods using Thorotrast have been employed by Wustmann (10), and by Mortensen and Sullivan (2); the latter authors have also employed Brominol. Consideration of the collected information on the absorption of cerebrospinal fluid (1) shows that much of it is qualitative in nature, and that there is a dearth of information as to the relative importance of the several possible routes for the

escape of the spinal fluid. It would appear that the roentgenographic method might be developed into a satisfactory procedure for the study of the physiology of the cerebrospinal fluid.

SUMMARY

Pantopaque introduced into the cranial cavities of dogs readily passes through the cribriform plate into the tissues of the cranial cavities and the lymphatics of the head. This pathway may play an important part in the absorption of the medium in lower orders. By utilization of this effect, a roentgenographic method for the study of neuroanatomy and neurophysiology of the head may be possible.

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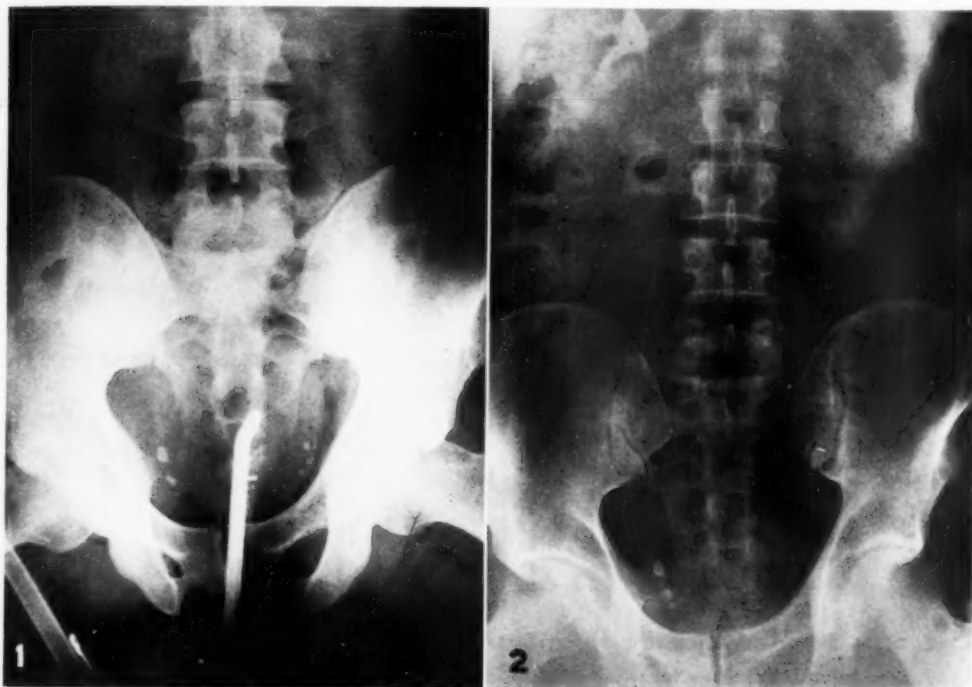
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Delayed Excretory Urography: Value of the Twenty-Four-Hour Urogram¹

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WITH EXCRETORY urography one of the manifestations of acute or chronic ureteral obstruction is a delay in the appearance of the contrast substance in the collecting system on the affected side,

it is sometimes assumed that this is the site of the obstruction. In some cases, however, when no such shadow is present, it may be assumed that the obstruction is due to a non-opaque stone or to ac-



Figs. 1 and 2. Case 1

Fig. 1. Catheter in the left ureter at the point of obstruction.

Fig. 2. Fifteen-minute urogram showing a positive nephrogram on the left side. Note the calculus shadow in the region of the left kidney pelvis.

whether it be from an intrinsic or an extrinsic cause. When the ureteral obstruction is recent, whether due directly or indirectly to the passage of a stone, the delay manifests itself first by an accentuation of the kidney shadow on the involved side, commonly known as a positive nephrogram. If a stone shadow is noted,

companying spasm. In either case, if necessary, the studies are carried beyond the nephrogram stage up to one to four hours. Usually by that time the collecting system and ureter will be well outlined to the point of block. If the point of obstruction has not then been established accurately, clinical judgment will determine whether to catheterize the ureter or to use more conservative measures.

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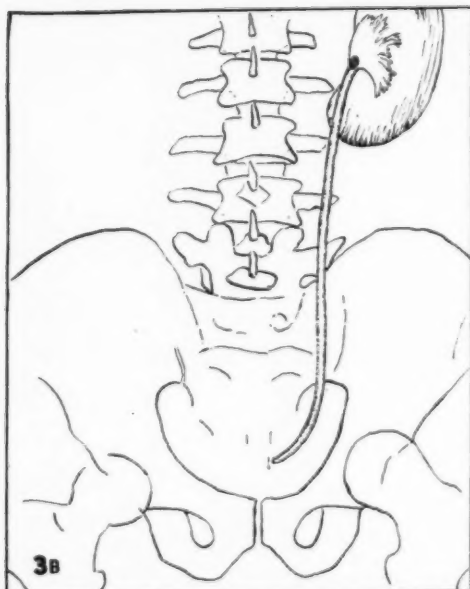


Fig. 3, A and B. Case 1. A. Twenty-four-hour urogram. The entire collecting system on the left side is well outlined to the point of obstruction. Note the calculus shadow at the left ureteropelvic junction. B. Sketch illustrating the extent of the delineation.

In the last few months we have had three cases in which an examination was made

Fig. 4. Case 1. Urographic study after removal of stone. Fifteen-minute urogram before release of compression. Note that the collecting systems on both sides are equally outlined as compared to Fig. 2.

twenty-four hours after the injection of the dye. Earlier studies failed to establish the point of block, but in each instance the collecting system and ureter on the affected side were clearly outlined to the site of obstruction in the twenty-four-hour study. In one case the shadows were still present at forty-eight hours. We are reporting the findings and clinical courses in these three cases to illustrate the value of twenty-four-hour excretory urograms in acute ureteral obstruction.

CASE REPORTS

CASE 1: A 38-year-old white married soldier entered the hospital on May 4, 1944, complaining of soreness in his left side and scrotum for twenty-four hours before admission. During that time there was an acute episode with sudden radiation of pain from the left loin to the left scrotum. The patient went to the Dispensary and was given some medication for relief; there was no blood in the urine. He went to bed but did not feel well. The following afternoon he had another acute attack, which required morphine, and he was admitted shortly thereafter.

The physical examination revealed no gross abnormalities. The temperature was 99°. There was pain in the left loin and costovertebral angle on deep pressure and percussion. The urine now contained many red blood cells. Sedatives and fluids were prescribed.

Cystoscopy was done the morning of May 5, 1944. A catheter was placed in the left ureteral orifice and an obstruction was met just beyond (Fig. 1). Attempts to pass a bougie, a Johnson basket, and a stone dislodger were all unsuccessful. Following this, the upper leaf of the left ureteral orifice was incised with cystoscopic scissors.

After the cystoscopy, excretory urograms were made. The preliminary plain abdominal film showed both kidneys outlined in normal position. There was a 7 × 5-mm. shadow of calcific density in the region of the left ureteropelvic junction, and several phleboliths were seen on both sides of the pelvis, but no stone was demonstrable at the site of the obstruction in the lower left ureter. Studies made at five and fifteen minutes showed a positive nephrogram on the left with no dye in the collecting system (Fig. 2). The right side was normal. The studies were not carried beyond thirty minutes at this time.

At twenty-four hours an abdominal film showed the left pelvis, calices, and ureter well outlined to a point just above the ureterocystic junction, which was where the obstruction was found when the left ureter was catheterized the day before (Fig. 3, A and B). The calculus previously noted in the region of the left ureteropelvic junction had not changed its position. Similar findings were noted at forty-eight hours, but the density of the collecting system was much less, indicating that partial drainage had occurred. It was felt that the block was due either to a non-opaque stone or to stone fragments too small to be visualized.

Another excretory urogram was made on May 8, 1944, three days after the first examination. A positive nephrogram was again obtained on the left side. The twenty-four-hour study, however, did not show any accumulation of the contrast substance in the collecting system, indicating that the block was not so great as at the time of the examination three days before.

Another attempt to catheterize the left ureter was made on May 11, but was unsuccessful. The left ureteral orifice was still inflamed and swollen. Cystoscopic examination on May 22, 1944, revealed less congestion of the left orifice, and a catheter was easily passed up the left ureter. The stone shadow was still present in the left pelvis, but no stone or obstruction was found in the lower ureter.

On June 2, 1944, a left ureterolithotomy was performed and a 10 × 5 × 5-mm. stone was removed from the ureter just below the left ureteropelvic junction. Convalescence was uneventful. Excretory urograms on June 17, 1944, were normal



Fig. 5. Case 2. Fifteen-minute urogram showing a positive nephrogram on the right side. The calculus shadow is in the lower right pelvis.

(Fig. 4). The patient was discharged to duty on July 8, 1944.

Comment: In this case the excretory urographic study was done after the presence of a block had been established following an attempt to catheterize the left ureter. Clinically, the symptoms pointed to a low obstruction, and this was confirmed by catheterization. However, when the stone at the ureteropelvic junction was noted on the plain film, it was also considered as a possible cause for the obstruction. The twenty-four-hour study clearly showed that the block was due to the obstruction in the lower left ureter and not to the stone in the upper tract, thus confirming the clinical impression.

CASE 2: A twenty-two-year-old white soldier was admitted to the hospital on May 5, 1944, at 3:00 A.M. He had felt well until the night before, when he experienced an aching pain in the right kidney region, which did not subside and subsequently became more severe. There was no radiation of the pain nor was any change noted in the color of the urine. A stone had been removed from

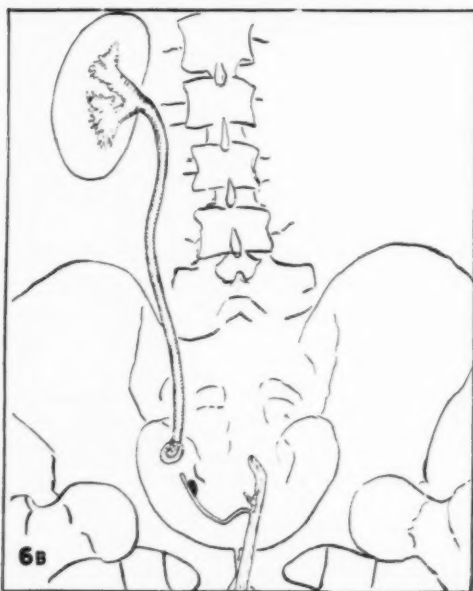


Fig. 6, A and B. Case 2. A. Twenty-four-hour urogram. Note the bulbous end of the dilated right ureter and the tip of the catheter at the site of the stone 3 cm. below the ureteral block. The collecting system is dilated and outlined as far as the diverticulum. B. Sketch illustrating the extent of the delineation.

the lower right ureter at another Army General Hospital on Feb. 10, 1944. Convalescence had been uneventful and the patient had returned to duty on March 25. This was the first attack of pain experienced since then.

Physical findings were not significant except for a scar in the right lower quadrant from the previous extraperitoneal ureterolithotomy. The temperature on admission was 99.6°. A few red cells were present in the urine.

Shortly after admission, a plain abdominal film showed a 5 × 3-mm. calculus shadow in the right lower ureter just above the ureterocystic junction. Thirty cubic centimeters of diodrast were administered and the examination was carried out over a period of forty-five minutes. Normal function and a normal pyelogram were seen on the left side. On the right side there was a positive nephrogram but no dye was seen in the collecting system over the period of forty-five minutes (Fig. 5).

The following morning, cystoscopy was performed and a catheter was inserted into the right lower ureter for a distance of 4 to 5 cm., when a block was encountered. The tip of the catheter was alongside the calculus. This was approximately twenty-four hours after the administration of the dye. At this time the right collecting system was well outlined to a point just below the lower border of the sacrum, 3 cm. above the calculus shadow. There were a moderate hydronephrosis and hydroureter (Fig. 6, A and B). The end of the dilated ureter was bulbous, probably due to a small diverticulum at the site of the previous ureterotomy. The following day, that is forty-eight hours after the injection of the dye, the pelvis and kidney were still faintly outlined by the contrast substance. At this time the diverticulum in the lower ureter was larger, but the stone shadow below it had not changed its position (Fig. 7).

The patient continued to have some fever, his temperature going as high as 102° on May 7. On May 8, an attempt was made to remove the calculus by ureteral manipulation through the cystoscope. This was unsuccessful and, immediately following this failure, an extraperitoneal ureterolithotomy was attempted. Due to the previous operation, however, the scar tissue was so dense that proper tissue cleavage was not obtained and the ureter could not be identified. A cystotomy was then performed, but the stone could not be found. A tube was left in the bladder. Convalescence was uneventful. On May 14, 1944, the stone passed spontaneously and a plain film showed no other calculi.

Check excretory urograms were made on May 26, 1944, and a normal pyelogram was obtained on the right side, with no evidence of delay in passage through the ureter. At the site of the large diverticulum previously noted, a small pouch filled with contrast substance still revealed itself, but the ureter below this to the ureterocystic junction was well outlined (Fig. 8).



Figs. 7 and 8. Case 2

Fig. 7. Forty-eight-hour urogram. The collecting system on the right is still faintly outlined, but the diverticulum at the site of the ureteral obstruction is larger. The calculus below it is still present.

Fig. 8. Fifteen-minute urogram twelve days following spontaneous passage of the stone. Note the normal pyelogram and the outlining of the lower right ureter as well as the persistent small diverticulum.

The patient was discharged to duty on June 16, 1944.

Comment: In this case the obstruction as established by the twenty-four-hour urogram was at the site of the diverticulum which had developed after the previous ureterolithotomy, even though, by retrograde examination, the ureteral catheter was found to be blocked by the small stone just above the ureterocystic junction, which was 3 cm. below the site of the actual obstruction. In all probability the clinical symptoms were due to the block at the site of the diverticulum and not to the passage of the stone down the ureter.

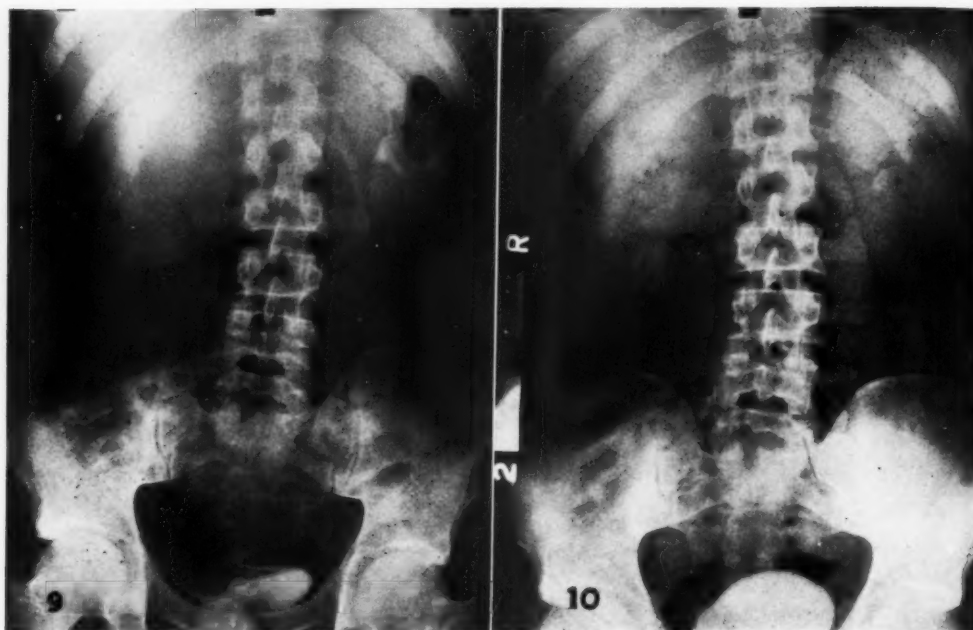
CASE 3: A thirty-four-year-old white soldier was admitted on June 15, 1944, with a diagnosis of right ureteral colic. The night before admission he had experienced right lumbar pain, which became quite severe and radiated to the right testicle. There had also been some nausea and vomiting.

Pain was present on pressure over the right loin and kidney area. The temperature was normal. A few red cells were found in the urine.

Shortly after admission, excretory urograms were made. The preliminary plain film showed no evidence of opaque stone in the urinary tract. A positive nephrogram was observed within fifteen minutes on the right side, but there was no evidence of any dye in the collecting system (Fig. 9). The left pyelogram and ureterogram were normal. Examinations at two (Fig. 10) and seven hours showed rather marked hydronephrosis on the right, but the ureter was still not outlined. The twenty-four-hour examination, however, outlined the entire right ureter, which was dilated as far as the ureterocystic junction, where there was an obstruction (Fig. 11, A and B).

A cystoscopy was performed on June 17, 1944, two days after admission, and a catheter was passed as far as the right kidney pelvis. No obstruction was encountered. The catheter was left in place for twenty-four hours.

A second excretory urogram was made on June 20, 1944, five days after the original study. Both sides revealed good function at five minutes and well outlined pyelograms were seen at fifteen minutes. At this time there was still some pyelectasis and evidence of moderate hydronephrosis on the right, but there had been a marked improvement since the examination of five days before (Fig. 12).



Figs. 9 and 10. Case 3

Fig. 9. Fifteen-minute urogram showing a positive nephrogram on the right side. The right kidney is slightly larger than the left.

Fig. 10. Two-hour urogram. The pelvis and calices on the right are faintly outlined, revealing a hydronephrosis.

The patient was discharged to duty on June 28, 1944.

Comment: In this case the exact cause for the obstruction at the ureterocystic junction was not determined. The hydronephrosis and hydroureter observed at the twenty-four-hour examination indicated that the block had been present for some time. There was relief from pain following catheter drainage of the obstruction, and the patient made an uneventful recovery. Following relief of obstruction, a check-up study within five days showed a marked improvement in the degree of hydronephrosis.

DISCUSSION

The phenomenon of the positive nephrogram associated with ureteral obstruction was noted by Wilcox (1). His experiments on rabbits showed that a block of the ureter must be present about sixty minutes before any accentuation of the kidney shadow oc-

curs. In most cases of acute ureteral obstruction in which excretory urograms are made, the block has been present for a few hours. The collecting system proximal to the block becomes distended moderately or greatly with urine, and back pressure on the kidney tubules and glomeruli results. Following the injection of the diodrast, its excretion by both the glomeruli and the tubular cells on the affected side will be delayed because of the increased pressure in the collecting system, in contrast to the normal time of its appearance on the unaffected side. Because of this increased pressure in the collecting system, the excreted dye remains longer in the tubules before diffusing into the urine. The dye in the tubular cells also remains there longer. Together the collection in the tubules and the retention in the tubular cells account for the positive nephrogram. The more complete the block, the greater will be the back pressure and the greater the delay of



Fig. 12. Case 3. Fifteen-minute urogram four days following Fig. 11. The obstruction had been relieved three days before. Note the equal excretion time on both sides. There is still some hydronephrosis on the right, especially pyelectasis.

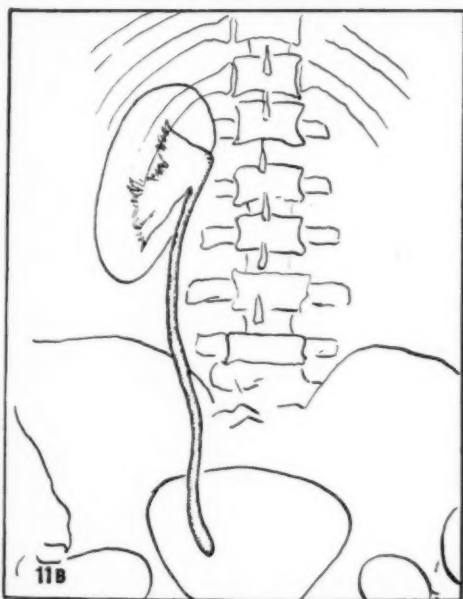


Fig. 11. A and B. Case 3. A. Twenty-four-hour urogram. The slightly dilated ureter is outlined as far as the ureterocystic junction. Note the well marked hydronephrosis. B. Sketch illustrating the extent of the delineation.

the diffusion of the contrast substance through the urine to the point of ureteral

obstruction. This difference in the degree of back pressure would seem to account for the different time intervals in which the tract is outlined as far as the point of obstruction. With fairly complete or complete block, even though the acute pain has subsided, the diffusion may not occur for many hours. Hence, the value of the delayed study at twenty-four hours.

In this department, each film is viewed immediately by the radiologist, and when there is a suppression of function, examinations are carried on at intervals of one to four hours. If the collecting system is not outlined to the point of obstruction after six to eight hours, another study is not made until twenty-four hours.

It should be emphasized that the clinical state should determine whether a patient with acute ureteral obstruction should be studied by excretory or by retrograde urography. Excretory studies are indicated if a block has been found following

ureteral catheterization or if the plain film shows a stone and a block is suspected (2). For complete evaluation of the clinical state, the affected urinary tract should be outlined to the point of obstruction if possible. When a delay in excretion is observed on the excretory urograms, it may be necessary to carry the examination over a period of several hours and, as illustrated by the case reports, an examination at twenty-four hours may give complete and valuable information which was not obtained with earlier studies.

CONCLUSION

Three cases of ureteral obstruction have been reported in which a twenty-four-hour

excretory urogram gave accurate information as to the exact site of the obstruction. The value of this delayed examination in excretory urography in general and its usefulness in cases of ureteral obstruction in which the exact site of obstruction had not been determined by the earlier urograms or by a retrograde examination have been discussed.

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Pulmonary Calcifications: Roentgenographic Observations in Relation to Histoplasmin and Tuberculin Reactions¹

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IT HAS RECENTLY been reported by one of the authors (1) that in the central eastern portion of the United States pulmonary calcification is more frequently associated with sensitivity to histoplasmin than to tuberculin or coccidioidin sensitivity. It is therefore important to re-evaluate the current concept of tuberculosis as the only significant cause of calcification in the lungs.

In recent years pulmonary calcification in tuberculin-negative persons has been demonstrated to be prevalent in the central eastern states: Kentucky, Arkansas, Illinois, Indiana, Iowa, Maryland, Mississippi, Missouri, North Carolina, Ohio, Tennessee, Virginia, and West Virginia (2-8). Infectious agents other than the tubercle bacillus have been considered as the possible causative factor. Olson *et al.* (7) sought but were unable to demonstrate a relationship to ascariasis. Aronson *et al.* (9) presented strong evidence in favor of coccidioidomycosis as the factor responsible for much of the pulmonary calcification found among Indians in the Southwest. Smith (10) has pointed out that the area of prevalence of tuberculin-negative pulmonary calcification corresponds with the endemic area of histoplasmosis, a fungous disease usually fatal. This is supported by a recent review (11) of 56 cases which have been recognized in this country.

The present study is based on the data reported by Palmer (1), together with additional material which has since been collected as part of a co-operative project conducted by the National Tuberculosis Association, the U. S. Public Health Service, and a large number of schools of nursing throughout the country. Roent-

genograms and the results of tuberculin and histoplasmin² skin tests are available for 6,199 student nurses in 8 large cities. From Table I it is evident that the inci-

TABLE I: PULMONARY CALCIFICATION IN STUDENT NURSES, WITH POSITIVE HISTOPLASMIN AND POSITIVE TUBERCULIN REACTIONS

City	Percentage of Student Nurses		
	With Calcification	With Histoplasmin Reaction*	With Positive Tuberculin Reaction†
Kansas City, Mo.	24.3	66.6	26.3
Columbus, Ohio	21.3	62.0	20.7
Kansas City, Kans.	20.4	53.1	29.5
Baltimore, Md.	10.9	27.0	29.7
New Orleans, La.	7.9	24.4	27.0
Philadelphia, Pa.	7.4	14.4	26.6
Detroit, Mich.	6.6	14.7	22.2
Minneapolis, Minn.	2.3	6.5	16.3

* Positive and doubtful.

† The population on which the tuberculin reactions are based is larger than in the other two columns, representing all student nurses tested with tuberculin in the various cities.

dence of pulmonary calcification shows a wide variation geographically—from 24.3 per cent in Kansas City, Mo., to 2.3 per cent in Minneapolis. The positive reactions to histoplasmin are closely parallel in distribution to the calcification, whereas no such parallel with positive tuberculin reactions was apparent in this material. For example, the level of tuberculin sensitivity was approximately the same in Kansas City, Mo., as in Philadelphia, 26.3 and 26.6 per cent, respectively. On the other hand, four times as many student nurses showed calcification in Kansas City as in Philadelphia, and over four times as many were sensitive to histoplasmin. Of 532 subjects with tuberculin-negative pulmonary calcification in the entire group of cities, all but 38 (5.4 per cent) were histo-

¹ Accepted for publication in August 1945.

² The dose of histoplasmin used in this study was 0.1 c.c. of a 1:1,000 dilution of the filtrate of a broth culture of *Histoplasma capsulatum*.

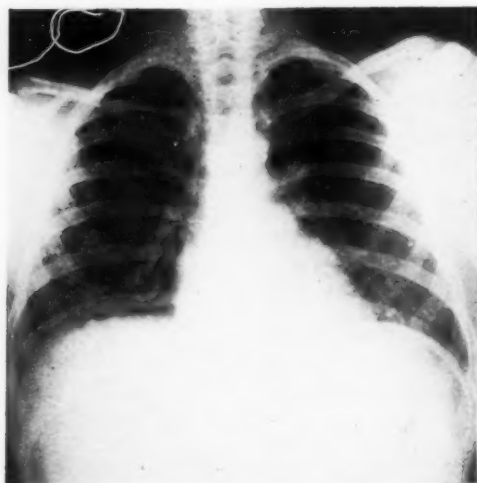


Fig. 1. Multiple bilateral calcification, miliary type, tuberculin-negative, histoplasmin-positive.

plasmin-positive. It is strongly suggestive that *Histoplasma capsulatum* or some immunologically related organism is responsible for the majority of instances of pulmonary calcification in regions such as Kansas City and Columbus, Ohio.

ROENTGENOLOGIC FINDINGS

There are no generally accepted criteria for the recognition of pulmonary calcification; the variation among different roentgenologists is extreme. Irregularity of outline, sharpness, and opacity are important considerations. Oval or round areas of density, when close to the hilum or to the lung bases, are difficult to interpret since they could possibly represent vascular markings. Round dense shadows in the periphery of the lung fields can be interpreted as calcification when the diameter exceeds that which would be expected of vascular markings in these areas.

In this study all films were reviewed by one person without knowledge of the tuberculin or histoplasmin reactions. Calcification was designated as definite, probable, or questionable. The *definite* category included calcification in which the size, density, sharpness, and irregularity of outline were so striking as to be regarded as unquestionable. *Probable* calcification

represented those shadows which were less definite than in the preceding group, but of such density and configuration as to seem to exclude vascular structures and calcifying costal cartilages. In many instances of this type the decision was made simpler by the availability of several films of the same subject. The *questionable* group embraced all shadows which could conceivably represent calcification but which the interpreter assumed were vascular or otherwise normal.

It was not possible to obtain oblique or lateral projections or to do roentgenoscopy, which would have been of great aid in differentiating vascular markings from calcification. In many instances several films were available for individual subjects; in those instances the finding of calcification was accordingly more definite and more accurate.

Since the primary purpose of the study was to detect the early tuberculous lesions, the hilar zone was relatively underexposed; calcification was probably not infrequently missed in these areas, but this error is constant throughout the series. Because of the criteria established in this study, it may well be that a number of instances of pulmonary calcification were not included.

A total of 6,199 student nurses were examined by roentgenography and tested with tuberculin and histoplasmin. Of this number, 698 showed pulmonary calcification. Among this group of 698 it was found that 57 were tuberculin-positive, 494 were histoplasmin-positive, and 109 had positive reactions to both tuberculin and histoplasmin. Of the 698 subjects with definite or probable calcification, only 38 (5.4 per cent) were negative to both tuberculin and histoplasmin. Little association could be found between questionable calcification and sensitivity to either antigen. This would be expected if vascular markings or other normal structures were placed in this category. The calcification discussed in this report, therefore, includes only the definite and probable categories.

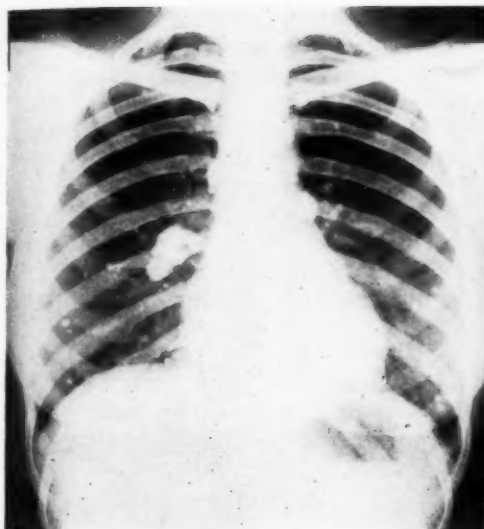


Fig. 2. Massive hilar calcification and bilateral small calcific nodules, tuberculin-negative, histoplasmin-positive.

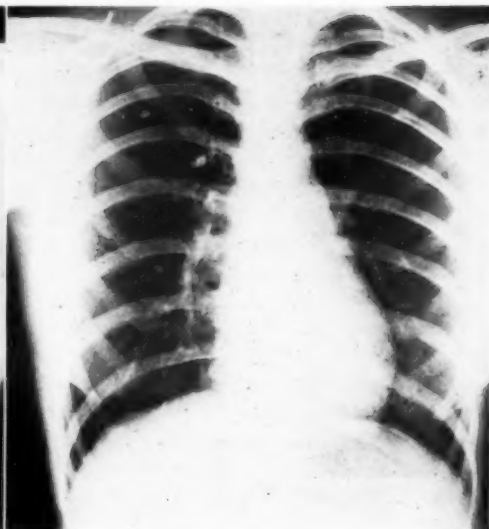


Fig. 3. Calcified primary complex, right second interspace anteriorly, tuberculin-negative, histoplasmin-positive.

An attempt was made to differentiate between calcification presumably due to tuberculosis (positive tuberculin, negative histoplasmin reactions) and that presumably due to histoplasmosis or an immunologically similar disease (positive histoplasmin, negative tuberculin reactions). The lung fields were divided into upper, middle, lower, and hilar zones and the number of instances in each group was noted. The calcareous deposits were also classified into various categories of individual size, shape, regularity of outline, homogeneity, and uniformity. The total number of separate calcific deposits seemed to be greater in histoplasmin-positive subjects than in those who were tuberculin-positive, but it is doubtful if this finding can be applied in the individual instance. In general, no striking or characteristic features of individual lesions have been seen thus far which would be of value in the differentiation between tuberculin-positive and histoplasmin-positive calcification except for instances of scattered multiple bilateral calcification, including the miliary type. In this series there were 15 instances of this kind (Fig. 1), of which 13 were tuberculin-negative and 2 tuberculin-

positive; 14 were histoplasmin-positive and 1 was negative to both antigens. With so small a series, definite conclusions cannot be drawn, but it is possible that histoplasmosis or an immunologically similar disease accounts for many instances of this type.

Massive calcification in the hilar zones has frequently been considered pathognomonic evidence of a healed primary tuberculous complex (12). Of 57 instances in which the calcification measured 2 cm. or more in diameter, 3 were tuberculin-positive only, 8 were tuberculin- and histoplasmin-positive, and 44 were histoplasmin-positive and tuberculin-negative. In 2 instances there was no sensitivity to either antigen. It is evident, therefore, that large single areas of calcification need not represent previous tuberculous infection.

DISCUSSION

There is little reason to assume that loss of tuberculin allergy or absorption of calcified lesions can account for the striking geographical distribution of the roentgenographically demonstrated pulmonary calcification.

The association of histoplasmin sensi-

tivity with calcification does not prove beyond doubt that *Histoplasma capsulatum* is the organism responsible for the findings, for we have not had the opportunity to follow bacteriologically proved lesions from inception to healing with calcareous deposition. In addition, since cross sensitivity must be considered, it is possible that an immunologically related organism may be responsible (10).

If the histoplasmin reaction is specific for infection by *Histoplasma capsulatum*, it will be necessary to abandon the concept of histoplasmosis solely as a disseminated disease involving the reticulo-endothelial system, lungs, skin, mucous membranes, suprarenal glands, and gastro-intestinal tract. By analogy with tuberculosis and coccidioidomycosis, it is probably fair to assume that in the great majority of instances histoplasmosis is a benign disease and only in the exceptional case will dissemination occur. Since the transient mild symptoms of the benign forms of tuberculosis and coccidioidomycosis are frequently unnoticed, it is only by skin testing that most instances of previous infection are discovered.

Pulmonary calcification is an end-result of a disease process; until the disease shall have been studied from the early infection to the stage of calcification, it is possible only to draw inferences concerning the nature of the active phase. In the many instances of healed primary complexes of the type usually considered typical of tuberculosis, it was not possible to distinguish between those with positive histoplasmin and tuberculin reactions. Furthermore, the end-result of calcification in the lungs and hilar lymph nodes suggests that the active phase will frequently mimic primary tuberculosis in childhood, with a focus in the lung parenchyma and involvement of the hilar lymph nodes. Massive involvement of lymph nodes is not infrequent, since in 44 instances of calcification in the lymph nodes measuring 2 cm. or more, the histoplasmin reaction was positive and the tuberculin reaction negative. In addition,

it is probable that the diagnosis of reinfection tuberculosis based on the finding of calcification in association with active tuberculosis is not always justified.

It is possible that in certain states, as Missouri, Kansas, and Ohio, tuberculosis is diagnosed more frequently than is warranted. In this study of student nurses several instances have been encountered of exudative minimal lesions which could not be distinguished from tuberculosis, but in which the tuberculin reaction has remained negative, and the histoplasmin reaction has been positive. An opportunity has not yet been afforded to determine conversion of the reaction to histoplasmin from negative to positive.

SUMMARY

In a study of 6,199 student nurses, 698 instances of pulmonary calcification were observed.

Evidence has been presented to indicate an association between pulmonary calcification and sensitivity to histoplasmin in the central eastern states of this country. It is likely that this sensitivity is an indication of previous infection with the fungus *Histoplasma capsulatum* or an immunologically related organism, and that infection with these organisms is not necessarily serious or fatal but is widespread in sub-clinical form.

Since in most instances it has not been possible to distinguish between tuberculin-positive and histoplasmin-positive calcification, it may be inferred that during the active phase of the infection the roentgenographic appearance of the benign form of histoplasmosis can resemble tuberculosis. Consideration of the tuberculin reaction and the recovery of the tubercle bacillus is therefore essential for the final diagnosis of pulmonary tuberculosis. This in no sense implies mis-diagnosis in the majority of instances of pulmonary tuberculosis, but is merely an urge to greater caution.

The authors are deeply indebted to Lydia B. Edwards, Surgeon (R), U. S. Public Health Service, for stimulation in this study.

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Taenia Saginata: A Case Report¹

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TAPEWORM infestation has previously been demonstrated roentgenologically. Penfold and Penfold (3) consider the roentgen demonstration more interesting as a scientific curiosity than a practicable means of diagnosis. It is believed, however, that occasionally a roentgenologic diagnosis of *Taenia saginata* will be of practical value.

The beef tapeworm is found wherever beef is eaten. Strong (4) reports that "it is the commonest large tapeworm of man, next to *Hymenolepis nana*, in the United States In some localities, as in Africa and Syria, and also among the Tibetans, one-fourth to three-fourths of the inhabitants are reported as infested. . . . The adult worm is found in the proximal part of the small intestine. It is from four to eight meters long and is made up of several hundred (up to 2,000) segments.

"When infected meat is eaten raw or inadequately cooked, the cyst wall is dissolved, the scolex attaches itself to the intestinal wall and grows rapidly, reaching the adult stage after about two months. The maximum duration of life is not known, but is at least several years."

CASE REPORT

The patient, aged sixty, was a tall, thin, emaciated white male, older in appearance than his stated age. His chief complaint was severe weight loss. He had been accepted for general service in August 1940. In May 1942, he was sent to Persia, where he experienced a chronic feeling of fatigue and began to lose weight. This, in his opinion, was incident to sweating associated with the excessive heat. In August 1942, he suffered an attack of sandfly fever. During his stay in Persia, there were no specific gastrointestinal symptoms except for occasional mild bouts of diarrhea due, he believed, to poor food. His symptoms continued, but he was not incapacitated, although he lost approximately 65 pounds. In January 1943, he returned to the United States, where during a thirty-day leave he regained 18 pounds. Following this, during an assignment in this coun-

try, he continued slowly to regain weight. In 1944, he was again found fit for overseas duty and in March departed for India.

Shortly after arrival, he began to suffer from anorexia, occasional mild lower abdominal cramps, and constipation, at times alternating with mild diarrhea. He attributed the symptoms to eating excessively greasy food. He began again to lose weight rapidly. The symptoms persisted, and by early July (1944) he had lost approximately forty-five pounds. He was returned to the United States. En route to the boat, his gastro-intestinal symptoms improved, due to the change in diet. After several weeks on board ship, a moderate painless edema of the feet and ankles developed, which improved after arrival in America.

Shortly after admission to this hospital, a barium enema study was performed, at which time the ileocecal valve failed to relax. A spastic, irritable colon and a sigmoid diverticulitis were reported. Additional gastro-intestinal studies were suggested.

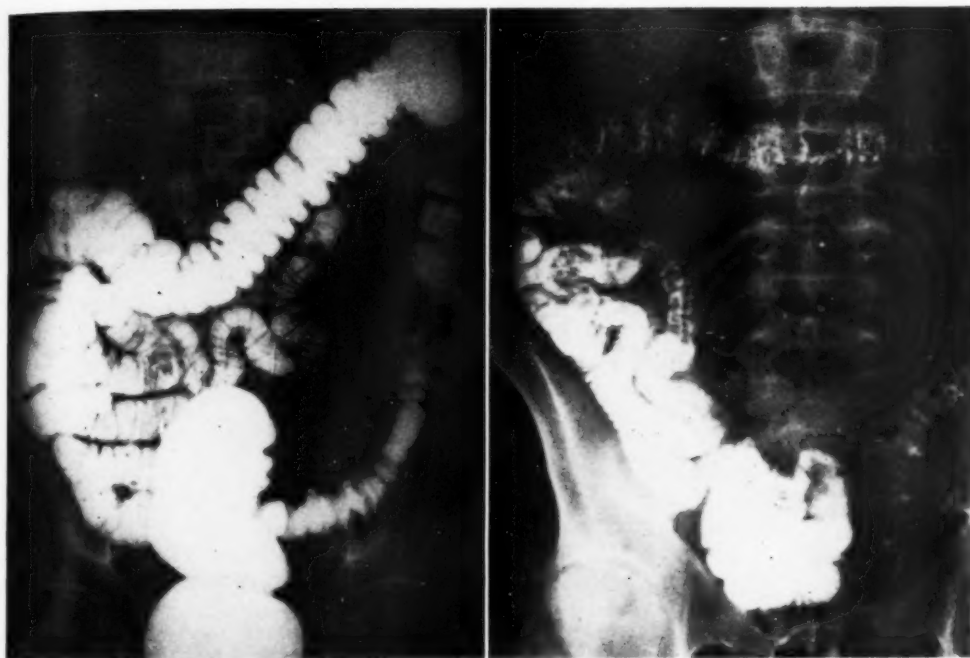
Routine laboratory studies were non-contributory. The sedimentation rate was within the limits of normal. One stool examination was made and the feces were reported negative for parasites, ova, and occult blood. The blood count, urinalyses, and blood chemistry were within normal limits. There was no eosinophilia.

On Nov. 27, the patient brought in a proglottis which he had found in his feces, which was identified as that of *Taenia saginata*. On the following day, another barium enema was given. The ileocecal valve relaxed and the barium flowed freely into the ileum. A long ribbon-like defect, consistent with the presence of *Taenia saginata*, was well demonstrated in the ileum (Fig. 1). The descending colon was irritable and spastic, and evidence of a moderate sigmoid diverticulitis was again obtained. Following evacuation of the enema, the terminal end of the beef tapeworm in the ileum was clearly shown (Fig. 2).

DISCUSSION

Taenia saginata, the beef tapeworm, when present in human intestines, may be diagnosed roentgenologically, and the finding may be of diagnostic importance since a routine stool examination may fail to reveal evidence of the condition. Our patient was treated before a small bowel series could be performed. Such an examination, it is believed, would usually be

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Figs. 1 and 2. Case of *Taenia saginata* infestation. Fig. 1 (on the left), made following the administration of a barium enema, shows a long ribbon-like filling defect representing the beef tapeworm in the ileum. The irritable descending colon and diverticulitis are also demonstrated. Fig. 2, made following evacuation of the enema, again shows clearly the ribbon-like defect in the ileum.

of greater value than a barium enema in diagnosing the presence of the parasites. Had not the tapeworm been found when barium flowed into the small intestine through the ileocecal valve, the patient's symptoms would have justified a small bowel series, since the diverticulitis could not have accounted for the severe weight loss, in addition to the diarrhea. One of the criteria given by Golden (2) as an indication for a small bowel series is diarrhea unexplained by studies of the colon.

Archer and Peterson (1) and others have reported the roentgenologic criteria for diagnosing the presence of *Ascaris lumbricoides* in the small intestines. The differential diagnosis, it is believed, can be made roentgenologically. *Taenia saginata* causes a ribbon-like filling defect, which is much longer than the defect caused by *Ascaris*. After evacuation, the double track outline, often seen in the presence of ascariasis, was not seen in this case and probably would not be seen in

similar cases, due to the structure of the cestode. Other types of tapeworm, it is believed, would cause filling defects in the small bowel not unlike those produced by *Taenia saginata*.

SUMMARY

Attention has been called to the possibility of diagnosing *Taenia saginata* roentgenologically prior to laboratory confirmation. The roentgen findings have been discussed. A case of intestinal infestation has been reported.

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Roentgenography of Adenoids¹

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IN THESE DAYS OF rapid advances in diagnostic technic we are inclined to overlook the value of the x-ray film in the diagnosis of simple ailments. Scanning the literature, one is impressed with the paucity of articles dealing with lesions of the epipharynx, particularly adenoids. Pancoast, Pendergrass, and Schaeffer (4) briefly mention adenoids in their excellent textbook. Young (5) passes them off with a few sentences. Adenoid vegetations were pointed out on the roentgen film as early as 1898 by Mignon (Paris). Grandy (1) gave a roentgenographic description of adenoids in 1925, and Groth (2) submitted a comprehensive paper on the roentgen aspects of the epipharynx and adenoids in 1933.

ANATOMY

The pharynx is a vertical musculomembranous passage, flattened anteroposteriorly, extending from the base of the skull above to the beginning of the esophagus below. Posteriorly it is in relationship with the cervical vertebrae; laterally, with the internal and common carotid arteries, the internal jugular vein, the sympathetic and last four cranial nerves. Anteriorly it communicates above with the nasal cavity, beneath this with the oral cavity, and below with the laryngeal cavity.

The pharynx is divided into three parts: the nasopharynx or epipharynx, which, according to the anatomical textbooks, is exclusively respiratory in function; the oropharynx, which is both respiratory and alimentary; and the laryngopharynx, which is almost entirely alimentary. On the ventral wall of the nasopharynx are the two choanae (posterior nares), separated by the vomer of the nasal septum. The floor of the nasopharynx is the upper

surface of the soft palate. Above and behind bilaterally on the lateral wall is located the pharyngeal recess (fossa of Rosenmüller), while below and in front on the lateral walls are found the openings of the eustachian tubes and their elevated boundaries. The posterior wall of the nasopharynx slopes forward above the level of the anterior arch of the atlas to become confluent with the roof or fornix of the pharynx. The mucosa of the fornix—and to a certain extent, also, the posterior wall—especially in children, is thrown into numerous folds which contain much lymphoid tissue, both diffuse and in the form of numerous characteristic nodules with crypt-like invaginations of the surface epithelium. This area constitutes the pharyngeal tonsil, or adenoids. According to Symington, the involution of the adenoids begins at about six to seven years and is usually completed at ten years.

When the patient is not phonating, the nasopharynx is open and the resulting clear area is readily observed on the x-ray film as a translucent passage, averaging approximately 1 cm. in its anteroposterior diameter. During phonation, as also during swallowing, the soft palate contracts and elevates, tending to encroach upon the nasopharynx and to obstruct communication between the oropharynx and nasopharynx.

We have noted that films taken on children during crying spells show a narrowing of the nasopharyngeal breathing space due to elevation and a tendency of the uvula to straighten out in a posterior direction. Changes in position seem to have no influence on the position of the uvula and soft palate. Any interference with this function is interpreted as due to disturbances in innervation or lesions involving the soft palate.

¹ Accepted for publication in August 1945.



Fig. 1. Adenoid hyperplasia with moderate encroachment on breathing space.

DIAGNOSIS

Although the clinical diagnosis of adenoid vegetations in the epipharynx is not difficult, the roentgenologist can be of considerable help to the general practitioner, pediatrician, and rhinologist, who see the majority of cases. Usually there is a history of lassitude, poor appetite, weight loss, pallor, lack of interest in games, and easy fatigue. Hyperplasia of the adenoids can be suspected in typical cases from the so-called adenoid facies, difficulty of respiration through the nose, sleeping with an open mouth, disturbances of phonation and hearing, and a predisposition to upper respiratory infections, otitis media, and mastoiditis.

Anterior and posterior rhinoscopy cannot be carried out in the great majority of cases, because of difficulty in getting cooperation from young patients. Palpa-

tion of the adenoids through the mouth not only induces physical trauma but may also produce psychic trauma. Even if palpation can be done on a co-operative patient, there are variations in personal opinions as to the amount of adenoid tissue present. Under these conditions it is felt that the roentgen examination can be depended upon to give an accurate diagnosis as to the presence or absence of abnormal soft tissue shadows in the epipharynx, at the same time obviating the disadvantages of physical examination with the finger or by rhinoscopy, while postoperative roentgen studies furnish a check on the thoroughness with which the epipharynx has been cleaned out.

In the X-Ray Department at the Munson Hospital we routinely take a lateral view of the epipharynx in all cases referred with requisitions asking for examina-



Figs. 2 and 3. Preoperative and postoperative adenoid demonstration. Note increase of breathing space.



Figs. 4 and 5. Apparent complete occlusion of posterior nasopharynx due to choanal atresia and adenoid hyperplasia. Figure 5 (below), made after instillation of 1 c.c. of lipiodol through the nares, shows that atresia is not complete.

tion of sinuses or mastoids, and in suspected cases of sinobronchial disease. The majority of these patients are infants and children. We have found the simplest and best procedure is to have the patient lie flat on his back staring up at a small Mickey Mouse (decal) on the ceiling. The tube is turned at right angles to the sagittal plane of the head. The film is held parallel to the sagittal plane of the head by resting it on end touching the patient's shoulder but not the head. The following factors are used: 50 kv., 1/4 sec., 50 mm., 25 ma.

The translucent shadow comprising the pharynx is in the form of a slightly bent rectangle. Its anterosuperior portion is bisected by the shadow of the soft palate and uvula, with the posterior nasopharynx above and the oropharynx below. The posterosuperior aspect of the pharynx is usually visualized as a straight or slightly convex soft-tissue shadow closely hugging the sloping contour of the base of the skull and continuous with the precervical tissues. The lymphoid tissue, if present, may project into the epipharynx as much as 6 or 7 mm. The base of the translucent pharynx is bisected by a soft-tissue shadow projecting upward and slightly forward. This is the epiglottis.

Not infrequently the tonsils can be visualized as an oral soft-tissue shadow superimposed on the pharyngeal space between the uvula and the epiglottis, just behind the base of the tongue.

On the basis of numerous measurements of lateral views of adenoid shadows in infants and children, any soft-tissue mass projecting 6 or 7 mm. from the sloping roof of the pharynx can be considered as pathological. In nearly all cases it represents hyperplasia of the adenoids. We have made the following classification: (1) minimal hyperplasia of the adenoids, 7-9 mm. in thickness, with slight encroachment (or none at all) on the postero-nasopharyngeal breathing space; (2) moderate hyperplasia, 1-1.5 cm., with moderate encroachment on the postero-nasopharynx; (3) marked hyperplasia, over

1.5 cm., with practically complete occlusion of the postero-nasopharynx.

Other lesions producing similar shadows should be thought of. When there is complete obliteration of the nasopharynx, one must consider the possibility of congenital choanal atresia. In such cases a few drops of lipiodol injected into the nares with the head supine, and a sufficient interval to allow the oil to flow back, will tell whether or not atresia is complete.

Infections, such as retropharyngeal abscess, must be differentiated by the position of the swelling and history.

Tumors include fibromas, carcinomas, Rathke's pouch tumors, and chordomas. Destruction or erosion of bone should be a differentiating factor in such cases. Rarely are protruding soft tissues associated with metastatic lesions of the upper cervical vertebrae.

SUMMARY

A single lateral roentgenogram of the pharyngeal area gives much anatomical and pathological information. It is especially advantageous in the differential diagnosis of soft-tissue masses of the epipharynx, and for routine employment in determining the presence or absence of enlarged adenoids. Advantages of x-ray over clinical examination of adenoids are as follows: (1) Avoidance of psychic trauma to children makes the examination a simple one. (2) The degree of breathing space encroachment can be accurately determined pre- and postoperatively.

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EDITORIAL

Radiation Treatment of Benign and Inflammatory Conditions

The radiation treatment of benign and inflammatory conditions occupies an important place in modern therapeutics. The number of lesions found to respond well to radiation therapy has gradually increased over a period of years until at present nearly half of the cases seen in the radiotherapy department are treated for benign or inflammatory conditions. This excludes the use of radiation in dermatology, where its efficacy has been well demonstrated and it is widely employed.

The list of non-malignant lesions successfully treated is a long one, too long, in fact, to be presented in an editorial. If, however, we exclude the group in which there is only a small percentage of good results, along with those conditions about which there is lack of agreement as to the value of the treatment, we are still left with an impressive number of lesions which respond satisfactorily, and with which we should all be familiar.

Radiation treatment for non-malignant conditions is well tolerated and gives a fair percentage of good results in such conditions. That we are able to treat these lesions successfully, without deleterious effects from the treatment, either immediate or late, is the result of the investigations and careful observations of many of the earlier roentgenologists. That there are some patients now living who have skin changes as a result of improper irradiation for non-malignant conditions is no credit to the profession or specialty. Referring physicians may feel assured that skin damage is not necessary in the treatment of benign or inflammatory lesions. We have learned that most of the conditions listed, with the exception of the

RADIATION TREATMENT OF NON-MALIGNANT CONDITIONS

Inflammatory

1. Tuberculous lymphadenitis
2. Acute lymphadenitis
3. Nasopharyngeal lymphoid hypertrophy
4. Parotitis
 - (a) acute postoperative
 - (b) chronic suppurative
5. Enlarged mediastinal lymph nodes following various infections, especially whooping cough
6. Herpes
 - (a) zoster
 - (b) simplex
7. Plantar warts

Benign Tumors

1. Angiomas
2. Cystic hygromas
3. Giant-cell tumors of bone
4. Fibroid uteri
5. Pituitary adenomas
 - (a) chromophil
 - (b) chromophobe
 - (c) basophil
6. Xanthomatosis

Other Conditions

1. Arthritis (Marie-Strümpell)
2. Bursitis
3. Cystic synovitis
4. Metrorrhagia (non-specific)
5. Keloids

pituitary adenomas and the giant-cell tumors, require only small fractionated doses of x-rays or radium, so small in fact that they may be frequently repeated if necessary.

For adenitis, such as that of tuberculous origin, radiation has for many years, in many localities, been the treatment of choice. Williams was the first to report on its efficacy nearly fifty years ago, but it has not been a generally accepted form of treatment until the past ten years. A review of 238 cases of tuberculous adenitis treated by surgery before 1928 and an equally large series treated by x-rays between 1928 and 1938 in our clinic revealed that the disease healed more rapidly after irradiation, especially if draining sinuses

were present. Nodes which were firm at the beginning of radiation treatment decreased or disappeared and we were able to obviate a large, unsightly surgical scar, which was replaced by a small biopsy incision. The follow-up shows, also, that recurrences are no more likely following radiation treatment than following surgery or prolonged bed rest. Acute lymphadenitis, especially in children, is usually readily controlled by one or two small applications of x-rays.

Reports by Fricke and Brown, of the Mayo Clinic, by Fowler, of the U. S. Medical Corps, and by Fisher, of Birmingham, Alabama, show conclusively that nasopharyngeal lymphoid hypertrophy is well controlled by x-ray or radium treatment, preferably radium. To quote Fricke and Brown, who reported on 76 cases in which radium was used, definite improvement was obtained in 45, temporary improvement in 13, and no improvement in 18. Sixty-one of their patients complained chiefly of deafness and tinnitus; in 15, the chief complaints were colds and frequent sore throats. Hypertrophied lymphoid tissue was present in each case and, after thorough medical studies and audiometer examination, treatment was instituted. Of the patients treated primarily for deafness, 33 obtained definite and apparently permanent improvement, 11 were temporarily benefited, and 17 showed no change. Of the patients with colds and sore throats, 12 were definitely and permanently improved, 2 temporarily improved, and 1 not improved.

In chronic suppurative parotitis small doses of x-rays are effective. The glands gradually decrease in size and the supuration disappears. We prefer to have sialograms of the duct and gland, as well as bacteriologic examination of the secretions, before treatment is instituted, in order that the degree of change in the duct and ductules be shown and that we may be certain that there is no stricture of any portion of the duct.

The radiation treatment of acute post-operative parotitis is well known to be

efficacious and at the present time is being used in conjunction with other therapeutic agents, which probably will supplant it in the near future, namely, penicillin and the sulfonamides.

There are probably as many treatments for arthritis as there are physicians who treat this disease, not to mention the laymen who have their own "pet" cures. Unfortunately, few types of treatment seem to stand the test of time, and the results are difficult to evaluate. Scott of London, some years ago, reported on the success of radiation treatment in Marie-Strümpell arthritis. Following his report, many others began using this form of therapy, and all observers agree on the analgesia obtained, which in many cases is permanent. All are in agreement, also—Scott, Hare, Oppenheimer, Friedman, Kuhns, and Morrison—that results are better in the early stages of the disease, but sufficient improvement may be obtained even in late cases to warrant the treatment. In the early cases, in which the disease is limited to the sacroiliac articulations, one may expect good results in 60 to 80 per cent, that is, loss of pain and improvement in motion. In the moderately advanced cases, good results are obtained in 30 to 60 per cent, and in the advanced cases in 15 to 30 per cent.

It is indeed gratifying that patients with Marie-Strümpell arthritis are relieved. Many of our cases have been followed since 1938, and most of those who were originally helped have maintained their improvement, though with occasional recurrence of pain and with some progression of symptoms. In most cases roentgenograms have continued to show progression of the disease, which confirms our opinion that the treatment should be used as an analgesic, not as a cure. If the pain is stopped, however, few if any skeletal deformities occur later on in life, which more than makes this type of treatment desirable.

Radiation treatment for other types of arthritis is being widely used. We have obtained temporary relief in some cases,

but in most instances our results have been discouraging.

In recent years, more and more cases of bursitis and peritendinitis have been referred to the radiology department for treatment. The strikingly good results which have been obtained by small fractionated doses of x-rays have surprised and pleased us all, especially in cases of acute bursitis or tendinitis of the shoulder joint, which is most frequently involved. Relief may be obtained with one or two treatments, but occasionally it is necessary to repeat the treatment at weekly intervals for five or six weeks. In approximately one-half the cases there is calcification in the tendons, indicating previous attacks of this condition or chronicity, but in 70 per cent of the cases relief may be obtained whether or not there is visible calcification. The calcification may remain visible although the patient becomes asymptomatic. In some cases in which an adhesive bursitis is found clinically, we have noted a complete return of motion following radio-

therapy, indicating the degree of muscle spasm present at the time of examination prior to treatment. Of 10 patients who were treated by x-rays following manipulation under anesthesia without relief, 7 were cured. The results were equally good whatever the location of the disease.

That similar good effects may be and are being obtained in the other conditions listed is an incentive to the radiologist to carry on further with lesions which are not amenable to other forms of treatment, and to try to improve his results in the group already known to be benefited by radiation.

As clinicians generally become cognizant of our ability to treat patients with inflammatory and benign lesions, even though it is in conjunction with other forms of therapy, we shall have the opportunity of treating more and more of these conditions, and results may be further improved.

HUGH F. HARE, M.D.
Lahey Clinic, Boston

The Annual Meeting Radiological Society of North America

The Program of the Thirty-second Annual Meeting of the Radiological Society of North America, to be held in Chicago, Dec. 1-Dec. 6, is in course of preparation. Contributions are invited, and those desiring to participate are urged to communicate at once with the Program Committee, of which Dr. Lowell Goin (1930 Wilshire Blvd., Los Angeles 5, Calif.) is chairman.

IN MEMORIAM

"... those immortal dead who live again
In minds made better by their presence."

Rollin Howard Stevens, M.D.

1868-1946

American radiology lost one of its pioneers and the Radiological Society of North America one of its most loyal members in the death, on May 17, 1946, of Dr. Rollin H. Stevens, at the age of seventy-eight, of an acute leukemia.

Rollin H. Stevens was born in Blenheim, Ontario, in 1868. He received his early education in Canada and later entered the Homeopathic Medical School of the University of Michigan, from which he received his degree in medicine in 1889. Immediately following his graduation he became one of the first interns at Grace Hospital, Detroit, and his association with that institution continued throughout his life.

During his early professional years, Dr. Stevens was particularly interested in dermatology and, in order to acquaint himself at first hand with the Finsen light treatment, then coming into widespread use, he visited Europe in 1902, spent a number of months at the Finsen Institute in Copenhagen, and attended dermatologic clinics in Germany, Austria, and Great Britain. The interest in light therapy thus stimulated extended to the therapeutic use of other radiations, and upon his return to Detroit, he decided to devote himself to the practice of radiology and dermatology. In 1904, he was appointed Dermatologist and Roentgenologist to Grace Hospital, which position he occupied until the time of his death.

In 1903, Dr. Stevens obtained his first supply of radium from the Curie Institute in Paris and two years later made his first report on its therapeutic application. He was thus one of the early American pioneers in radium and roentgen therapy. He was constantly on the alert for new advances in equipment and technic and was deeply concerned with problems of standardization and protection. His achievements in his specialty were recognized on his seventieth birthday by the publication (January 1938) of the Rollin Howard Stevens Birthday issue of *RADIOLOGY*, containing "an anniversary chronicle of his useful life" and a bibliography of his scientific papers to that date.

The subject of cancer was one of paramount interest to Dr. Stevens, both in its biologic and therapeutic aspects. He realized fully the magnitude of the problem and the necessity for co-opera-

tive effort on the part of scientists from many fields for its ultimate solution. In his later years his consuming passion was the establishment of facilities for cancer research, and through his enthusiasm and persistent efforts there came into being the Detroit Institute of Cancer Research, of which he was the first president. His devotion to this project led him to give largely of his time and thought, even during the trying days of his last illness, to assure its continuation adequately housed and under competent direction.

Dr. Stevens was a member of the American Roentgen Ray Society; the American Radium Society, of which he was president in 1933-34; and the Radiological Society of North America, which he served as president in 1924. He was a founder of the American College of Radiology, was several times a chancellor of that organization and its president in 1930-31. He was one of the founders, also, of the American Board of Radiology and for a number of years was one of its examiners. He was active in the organization of the Detroit X-Ray and Radium Society, serving as its president in 1926. He was president of the Detroit Dermatological Society in 1927.

The problems of medicine did not, however, occupy Dr. Stevens to the exclusion of other interests. His achievements in mycology, his pride in his large collection of shells, and his devotion to his gardens were known to all his intimates. He spent much time and energy, also, in civic affairs. The Social Hygiene Society of Detroit was organized through his efforts, and he was a founder and active promoter of the Boys' Republic at Farmington, Mich.

Those who were privileged to know and work with Dr. Stevens have had their lives enriched by association with a real scientist, a beloved physician, and a true gentleman. His unbounded enthusiasm and catholicity of interests kept him ever youthful in mind and spirit, an inspiration both to his younger colleagues and his contemporaries.

Dr. Stevens is survived by his wife, Dr. Mary Thompson Stevens, a daughter, Mrs. Milton Davis, and two granddaughters.

HOWARD P. DOUB, M.D.



ROLLIN HOWARD STEVENS, M.D.
1868-1946

Albert Soiland, M.D.

1873-1946

American radiologists grieve for the loss of one of their pioneers. Dr. Albert Soiland of Los Angeles, California, died in Stavanger, Norway, on May 14. He had sailed on April 7 from the Pacific coast, through the Panama Canal, and across the Atlantic, to enjoy a visit at his home in Norway. A few days after his arrival, he suffered a sudden heart attack, which proved fatal. Funeral services were held for him in Stavanger on May 18. His ashes will be returned to America.

Albert Soiland was born in Norway, May 5, 1873, the son of Edward and Axeline Christine (Halversen) Soiland. The first ten years of his life he spent in his native land and the following sixty-three years in America. He married Dagfine Berner Svensen of Stavanger, Norway, in 1902.

The list of Dr. Soiland's activities and accomplishments denotes the fullness of his life in America. He received his medical education at the University of Southern California, from which he was graduated in 1900. His interest in radiology began during his college days, and as early as April 1902 he published "A Case of Carcinoma of the Breast Treated by X-Rays." In the earlier years of his practice he contributed to all phases of radiology; later he devoted himself to therapeutic irradiation. With his associates he established the Albert Soiland Radiological Clinic in 1910. Later, as senior member of Soiland, Costolow, and Meland, specializing in the study and treatment of cancer and allied diseases, he established the Los Angeles Tumor Institute.

For some years Dr. Soiland had been formulating plans for creating a foundation to promote the study and prevention of cancer, and shortly before his death he established the Albert Soiland Cancer Foundation, deeding to it the California Medical Building, which he owned, and a sum of approximately one million dollars. In addition to cancer research, the foundation will provide fellowships in the study and control of cancer.

Dr. Soiland was a diplomate of medical radiology and electrology, University of Cambridge, England; a diplomate of the American Board of Radiology; founder and former professor in the Department of Radiology, College of Medicine and Surgery, University of Southern California; founder-member of the School of Medicine, University of Southern California; founder, past president, fellow (honorary), and medalist of the American College of Radiology; past president of the American Radium So-

ciety; past president of the Western Division of the American Roentgen Ray Society; a founder and past chairman of the Section on Radiology of the American Medical Association, the Section on Radiation of the California Medical Association, and the Section on Radiology of the Los Angeles County Medical Association. He was a member of the Radiological Society of North America and one of its early presidents (1918). In recognition of his services to the Society and his numerous contributions to RADIOLOGY, the May 1933 issue of that journal was dedicated to him, honoring his sixtieth birthday. The list of his contributions to the literature appearing there includes some 150 titles.

To recount, with even a brief reference, Dr. Soiland's outstanding activities and achievements would require space not available here. His interest in medical organization work led him to attend many society meetings in this country and abroad, and his name was frequently found on scientific programs. His attendance at national and international gatherings as a representative of the U. S. Navy began in 1915 (Lieut. j.g., M.R.C., U.S.N.) and continued into World War II (Captain, M.C. V.(S) U.S.N.R. ret. act), constituting a duty which he performed with dignity and good fellowship.

Pausing to consider the great number of occasions in which he participated over so many years, in so many places, all requiring special preparation, in addition to his extensive daily responsibilities in medical radiology, we stand aghast. It was obvious to those of us who knew him more intimately how fully his wakeful moments were utilized; his mind was always active in a constructive way.

Dr. Soiland was courageous, enthusiastic, and tireless in all of the activities with which he became identified. It is gratifying that he lived to see the success of so many of his undertakings both in and out of the realm of medicine.

In the development of radiology in North America he played a significant role. He was a leader in elevating it to a specialty of the first rank, eliminating the imposters, and linking it solidly with medical science within the medical profession. His intimate companions and his associates in the Institute he founded had an affection for him which was nothing short of love. He leaves indelible memories of loyalty and friendliness with hosts of physicians in all divisions of medicine, here and throughout the world.

BENJAMIN H. ORNDORFF, M.D.



ALBERT SOILAND, M.D.
1873-1946

ANNOUNCEMENTS

CALIFORNIA MEDICAL ASSOCIATION SECTION ON RADIOLOGY

The Radiological Section of the California Medical Association has selected the following officers for the ensuing year: Gordon G. King, M.D., of San Francisco, Chairman; D. R. MacColl, M.D., of Los Angeles, Secretary.

FLORIDA RADIOLOGICAL SOCIETY

The recently elected officers of the Florida Radiological Society are: Charles M. Gray, M.D., of Tampa, President; James F. Pitman, M.D., of Lake City, Vice-President; Maxey Dell, Jr., M.D., of Gainesville, Secretary.

RADIOLOGICAL SOCIETY OF NEW JERSEY

At the annual meeting of the Radiological Society of New Jersey, the following were elected to office: Dr. John Olpp, Englewood, President; Dr. H. R. Brindle, Asbury Park, Vice-President; Dr. W. H. Seward, Orange, Secretary; Dr. R. Pomeranz, Newark, Treasurer; Dr. C. B. Henle, Newark, Councillor to the Radiological Society of New Jersey; Dr. H. J. Perlberg, Jersey City, Councillor to the American College of Radiology.

PENNSYLVANIA RADIOLOGICAL SOCIETY

The Thirty-first Annual Meeting of the Pennsylvania Radiological Society was held in Reading, Penna., on May 17 and 18. The program included papers by Leslie H. Osmond, M.D., of Pittsburgh; George W. Chamberlin, M.D., of Reading; Edith H. Quimby, Sc.D., of New York City; E. C. Baker, M.D., of Youngstown, Ohio; Zoe A. Johnston, M.D., of Pittsburgh; J. L. Weatherwax, M.A., of Philadelphia; Burrill B. Crohn, M.D., of New York City; Samuel G. Henderson, M.D., and Melvin Meyers, M.D., of Pittsburgh; Ralph Bromer, M.D., of Bryn Mawr; Robert P. Barden, M.D., of Philadelphia; Harold W. Jacox, M.D., of Pittsburgh; and Louis A. Milkman, M.D., of Scranton.

The *Pennsylvania Journal of Radiology* issued on this occasion was dedicated to Dr. Sydney James Hawley, "gentleman, scholar, author, scientist, poet, and musician." Dr. Hawley has recently severed his connection with the Geisinger Memorial Hospital, Danville, Penna., to return to the city of his birth, Seattle, Wash.

UTAH STATE RADIOLOGICAL SOCIETY

At a dinner meeting on May 15, radiologists of Utah organized the Utah State Radiological Society. Dr. James P. Kerby of Salt Lake City was elected

President and Dr. M. Lowry Allen, also of Salt Lake City, Secretary-Treasurer. Meetings are to be held on the third Wednesday in the following months: September, November, January, March, and May.

MID-SUMMER RADIOLOGICAL CONFERENCE

As announced in the May issue of *RADIOLOGY*, the Rocky Mountain Radiological Society is resuming its Mid-Summer Radiological Conference, to be held in Denver, Colo., Aug. 8-10, 1946. The program committee is arranging an excellent program, with Dr. John Camp, Dr. William E. Costolow, Dr. Ross Golden, and Dr. Dabney Kerr as guest speakers. Radiologists and other physicians are urged to attend.

RADIOLOGISTS HONORED BY STATE MEDICAL SOCIETIES

Radiologists in general, and members of the Radiological Society of North America in particular, will be glad to hear of honors recently accorded to two of their number. Dr. Harold A. Spilman of Ottumwa, Iowa, a member of the Society since 1924, was elected president of the Iowa State Medical Society at its annual convention, April 19. That radiologists have the respect and esteem of their professional colleagues is evidenced by the fact that Dr. Spilman is the seventh member of the Iowa X-Ray Club, the fifth member of the Radiological Society, the fourth Fellow of the American College of Radiology, and the third Diplomate of the American Board of Radiology to receive the highest honor that Iowa physicians can award a colleague.

A similar honor has been accorded Dr. Edgar P. McNamee, of Cleveland, Ohio, who at the recent meeting of the Ohio State Medical Society assumed the presidency of that organization.

RADIO ISOTOPES FROM THE MANHATTAN PROJECT

A detailed announcement on the availability and procurement of pile-produced radio isotopes from the Manhattan Project appears in the June 14 issue of *Science*.

Tables are included giving pertinent data on the characteristics and the quantities which may be made available of around 100 isotopes and isotopic mixtures. For practical reasons isotopes with a half-life less than twelve hours are not considered for distribution. Most of the isotopes are produced by fission or (n) processes. Only four isotopes are produced by the (n, p) process with sufficient yield

for distribution. Other processes are either not sufficiently productive or do not occur.

The article emphasizes that (1) present piles were not designed for tracer and therapeutic isotope production, (2) waste plutonium process solutions are not a feasible source for separated fission isotopes, (3) routine production methods and facilities are not yet developed for most isotopes, (4) isotopes which can now be made available are only experimental lots resulting from research and development proceedings, (5) technical problems involved in the irradiation and processing of essential materials have been and will continue to be responsible for the delay in making certain isotopes available by routine production.

Allocation and distribution will be effected on the basis of the general policies, as well as on recommendations regarding specific applications, made by well qualified advisory groups nominated for Manhattan District appointment by the National Academy of Sciences. Charges will be made for materials and services on the basis of "out-of-pocket" operational expenses to the Government necessitated by

the non-project production and service program. Costs for construction or rental of major plant facilities and expenses of research and development on isotope production will be assumed by the Project.

All correspondence concerning radio isotope procurement should be addressed to the Isotopes Branch, Research Division, Manhattan District, P. O. Box E, Oak Ridge, Tennessee. Reference to the original article for pertinent details is recommended before the institution of inquiries or requests.

AMERICAN CONGRESS OF PHYSICAL MEDICINE

The American Congress of Physical Medicine will hold its Twenty-fourth Annual Scientific and Clinical Session September 4-7, inclusive, at the Hotel Pennsylvania in New York. In addition to the scientific sessions, the annual instruction courses will be held Sept. 4, 5, and 6. Further information may be obtained from the American Congress of Physical Medicine, 30 North Michigan Ave., Chicago 2, Ill.



RADIOLOGICAL SOCIETIES OF NORTH AMERICA

Editor's Note.—Will secretaries of societies please cooperate by sending information to Howard P. Doub, M.D., Editor, Henry Ford Hospital, Detroit 2, Mich.

UNITED STATES

Radiological Society of North America.—Secretary, D. S. Childs, M.D., 607 Medical Arts Bldg., Syracuse 2, N.Y.

American Roentgen Ray Society.—Secretary, Harold Dabney Kerr, M.D., Iowa City, Iowa.

American College of Radiology.—Secretary, Mac F. Cahal, 20 N. Wacker Dr., Chicago 6, Ill.

Section on Radiology, American Medical Association.—Secretary, U. V. Portmann, M.D., Cleveland Clinic, Cleveland 6, Ohio.

ARKANSAS

Arkansas Radiological Society.—Secretary, Fred Hames, M.D., Pine Bluff. Meets every three months and annually at meeting of State Medical Society.

CALIFORNIA

California Medical Association, Section on Radiology.—Secretary, D. R. MacColl, M.D., 2007 Wilshire Blvd., Los Angeles 5.

Los Angeles County Medical Association, Radiological Section.—Secretary, Roy W. Johnson, M.D., 1407 South Hope St., Los Angeles. Meets second Wednesday of each month at County Society Building.

Pacific Roentgen Society.—Secretary, L. Henry Garland, M.D., 450 Sutter St., San Francisco 8. Meets annually with California Medical Association.

San Diego Roentgen Society.—Secretary, R. F. Niehaus, M.D., 1831 Fourth Ave., San Diego, Calif. Meets first Wednesday of each month.

San Francisco Radiological Society.—Secretary, Joseph Levitin, M.D., 516 Sutter St., San Francisco 2. Meets monthly on the third Thursday at 7:45 p.m., first six months of the year in Lane Hall, Stanford University Hospital, and second six months in Toland Hall, University of California Hospital.

COLORADO

Denver Radiological Club.—Secretary, A. Page Jackson, Jr., M.D., 304 Republic Bldg., Denver 2. Meetings third Friday of each month, Denver Athletic Club.

CONNECTICUT

Connecticut State Medical Society, Section on Radiology.—Secretary, Max Climan, M.D., 242 Trumbull St., Hartford 3. Meetings bimonthly, second Thursday.

FLORIDA

Florida Radiological Society.—Secretary-Treasurer, Maxey Dell, Jr., M.D., 333 West Main St., S., Gainesville.

GEORGIA

Georgia Radiological Society.—Secretary-Treasurer, James J. Clark, M.D., 478 Peachtree St., N. E., Atlanta 3. Meets in November and at the annual meeting of State Medical Association.

ILLINOIS

Chicago Roentgen Society.—Secretary, Fay H. Squire, M.D., 1753 W. Congress St., Chicago 12. Meets at the Palmer House, second Thursday of October, November, January, February, March, and April.

Illinois Radiological Society.—Secretary-Treasurer, William DeHollander, M.D., St. Johns' Hospital, Springfield. Meetings quarterly by announcement.

Illinois State Medical Society, Section on Radiology.—Secretary, Frank S. Hussey, M.D., 250 East Superior St., Chicago 11.

INDIANA

The Indiana Roentgen Society.—Secretary-Treasurer, J. A. Campbell, M.D., Indiana University Hospitals, Indianapolis 7. Annual meeting in May.

IOWA

The Iowa X-ray Club.—Secretary, Arthur W. Erskine, M.D., 326 Higley Building, Cedar Rapids. Meets during annual session of Iowa State Medical Society.

KENTUCKY

Kentucky Radiological Society.—Secretary-Treasurer, Sydney E. Johnson, M.D., 101 W. Chestnut St., Louisville.

LOUISIANA

Louisiana Radiological Society.—Secretary-Treasurer, Johnson R. Anderson, M.D., North Louisiana Sanitarium, Shreveport. Meets annually at same time as State Medical Society.

Orleans Parish Radiological Society.—Secretary, Joseph V. Schlosser, M.D., Charity Hospital of Louisiana, New Orleans 13. Meets first Tuesday of each month.

Shreveport Radiological Club.—Secretary, Oscar O. Jones, M.D., 2622 Greenwood Road. Meets monthly September to May, third Wednesday, 7:30 p.m.

MARYLAND

Baltimore City Medical Society, Radiological Section.—Secretary, Charles N. Davidson, M.D., 101 West Read St., Baltimore 1.

MICHIGAN

Detroit X-ray and Radium Society.—Secretary-Treasurer, E. R. Witwer, M.D., Harper Hospital, Detroit 1. Meetings first Thursday of each month from October to May, at Wayne County Medical Society club rooms.

MINNESOTA

Minnesota Radiological Society.—Secretary, A. T. Stenstrom, M.D., Minneapolis General Hospital, Minneapolis 26. Meetings quarterly.

MISSOURI

Radiological Society of Greater Kansas City.—Secretary, John W. Walker, M.D., 306 E. 12th St., Kansas City, Mo. Meetings last Friday of each month.

St. Louis Society of Radiologists.—Secretary, Edwin C. Ernst, M.D., 100 Beaumont Medical Bldg. Meets on fourth Wednesday of each month, October to May.

NEBRASKA

Nebraska Radiological Society.—Secretary-Treasurer, Donald H. Breit, M.D., University of Nebraska Hospital, Omaha 5. Meetings third Wednesday of each month at 6 p.m. in either Omaha or Lincoln.

NEW ENGLAND

New England Roentgen Ray Society.—Secretary-Treasurer, George Levene, M.D., Massachusetts Memorial

Hospitals, Boston, Mass. Meets monthly on third Friday at Boston Medical Library.

NEW HAMPSHIRE

New Hampshire Roentgen Society.—Secretary-Treasurer, Richard C. Batt, M.D., St. Louis Hospital, Berlin.

NEW JERSEY

Radiological Society of New Jersey.—Secretary, W. H. Seward, M.D., Orange Memorial Hospital, Orange. Meetings at Atlantic City at time of State Medical Society and midwinter in Newark as called.

NEW YORK

Associated Radiologists of New York, Inc.—Secretary, William J. Francis, M.D., East Rockaway, L. I.

Brooklyn Roentgen Ray Society.—Secretary-Treasurer, Abraham H. Levy, M.D., 1354 Carroll St., Bklyn. 13. Meets fourth Tuesday of every month, October to April.

Buffalo Radiological Society.—Secretary-Treasurer, Mario C. Gian, M.D., 610 Niagara St., Buffalo 1. Meetings second Monday evening each month, October to May, inclusive.

Central New York Roentgen Society.—Secretary-Treasurer, Carlton F. Potter, M.D., 425 Waverly Ave., Syracuse 10. Meetings in January, May, and October.

Long Island Radiological Society.—Secretary, Marcus Wiener, M.D., 1430 48th St., Brooklyn 19. Meetings fourth Thursday evening each month at Kings County Medical Bldg.

New York Roentgen Society.—Secretary, Wm. Snow, M.D., 941 Park Ave., New York 28.

Rochester Roentgen-Ray Society.—Secretary, Murray P. George, M.D., 260 Crittenden Blvd., Rochester 7. Meets at Strong Memorial Hospital, third Monday, September through May.

NORTH CAROLINA

Radiological Society of North Carolina.—Secretary-Treasurer, Major I. Fleming, M.D., 404 Falls Road, Rocky Mount. Meets in May and October.

NORTH DAKOTA

North Dakota Radiological Society.—Secretary, Charles Heilman, M.D., 1338 Second St., N., Fargo.

OHIO

Ohio Radiological Society.—Secretary, Henry Snow, M.D., 1061 Reibold Bldg., Dayton 2. Next meeting at annual meeting of the Ohio State Medical Association.

Cleveland Radiological Society.—Secretary-Treasurer, Carroll C. Dundon, M.D., 11311 Shaker Blvd., Cleveland 4. Meetings at 6:30 P.M. on fourth Monday of each month from October to April, inclusive.

Radiological Society of the Academy of Medicine (Cincinnati Roentgenologists).—Secretary-Treasurer, Samuel Brown, M.D., 707 Race St., Cincinnati 2. Meetings held third Tuesday of each month.

PENNSYLVANIA

Pennsylvania Radiological Society.—Secretary-Treasurer, L. E. Wurster, M.D., 416 Pine St., Williamsport 8.

Philadelphia Roentgen Ray Society.—Secretary, Calvin L. Stewart, M.D., Jefferson Hospital, Philadelphia 7. Meets first Thursday of each month at 8:00 P.M., from October to May in Thomson Hall, 21 S. 22d St.

Pittsburgh Roentgen Society.—Secretary-Treasurer, Lester M. J. Freedman, M.D., 4800 Friendship Ave.,

Pittsburgh 24. Meets second Wednesday of each month at 6:30 P.M., October to May, inclusive.

ROCKY MOUNTAIN STATES

Rocky Mountain Radiological Society.—Secretary, A. M. Popma, M.D., 220 N. First St., Boise, Idaho.

SOUTH CAROLINA

South Carolina X-ray Society.—Secretary-Treasurer, Robert B. Taft, M.D., 103 Rutledge Ave., Charleston 16.

TENNESSEE

Memphis Roentgen Club.—Chairmanship rotates monthly in alphabetical order. Meetings second Tuesday of each month at University Center.

Tennessee Radiological Society.—Secretary-Treasurer, J. Marsh Frère, M.D., 707 Walnut St., Chattanooga. Meets annually with State Medical Society in April.

TEXAS

Dallas-Fort Worth Roentgen Study Club.—Secretary, X. R. Hyde, M.D., Medical Arts Bldg., Fort Worth 2. Meetings on third Monday of each month, in Dallas in the odd months and in Fort Worth in the even months.

Texas Radiological Society.—Secretary-Treasurer, R. P. O'Bannon, M.D., 650 Fifth Ave., Fort Worth 4.

UTAH

Utah State Radiological Society.—Secretary-Treasurer, M. Lowry Allen, M.D., Judge Bldg., Salt Lake City 1. Meets third Wednesday, January, March, May, September, November.

VIRGINIA

Virginia Radiological Society.—Secretary, E. Latan Flanagan, M.D., 215 Medical Arts Bldg., Richmond 19.

WASHINGTON

Washington State Radiological Society.—Secretary-Treasurer, Thomas Carlile, M.D., 1115 Terry Ave., Seattle. Meetings fourth Monday of each month, October through May, at College Club, Seattle.

WISCONSIN

Milwaukee Roentgen Ray Society.—Secretary-Treasurer, C. A. H. Fortier, M.D., 231 W. Wisconsin Ave., Milwaukee 3. Meets monthly on second Monday at the University Club.

Radiological Section of the Wisconsin State Medical Society.—Secretary, S. R. Beatty, M.D., 185 Hazel St., Oshkosh. Two-day annual meeting in May and one day in connection with annual meeting of State Medical Society in September.

University of Wisconsin Radiological Conference.—Meets first and third Thursdays 4 to 5 P.M., September to May, inclusive, Room 301, Service Memorial Institute, 426 N. Charter St., Madison 6.

CANADA

Canadian Association of Radiologists.—Honorary Secretary-Treasurer, J. W. McKay, M.D., 1620 Cedar Ave., Montreal.

La Société Canadienne-Française d'Electrologie et de Radiologie Médicales.—General Secretary, Origène Dufresne, M.D., Institut du Radium, Montreal. Meets on third Saturday of each month.

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ROENTGEN DIAGNOSIS

THE HEAD AND NECK

Radiology of War Injuries. Part V. War Wounds of the Orbit and Eyeball. D. B. McGrigor and Eric Samuel. *Brit. J. Radiol.* 18: 284-290, September 1945.

In half of a series of 600 orbital injuries sustained in battle, intra-ocular foreign bodies were found to be present; 50 per cent of these were demonstrable radiographically.

In no field is greater accuracy required than in the study of injuries of the orbit. A preliminary examination should be made to determine whether or not a foreign body is present. This is usually done with a postero-anterior and a lateral view. Non-screen films have the advantage of affording greater detail, with less likelihood of extraneous shadows, but the greater exposure time increases the chances of motion, with consequent blurring of the foreign-body shadow. In general, films made with good clean screens are preferable. If a foreign body is present, it is advisable to make further films with the eye in various positions, looking up and looking down. The direction and degree of shift of the shadow of the foreign body will indicate in what portion of the eyeball it lies.

No entirely satisfactory method of localization has been worked out. With foreign bodies near the periphery, an accuracy of 0.5 mm. is desirable. The limbus ring method and the equatorial ring method have the disadvantage of possible trauma to an already injured eye and they do not adequately take into consideration projection errors. McGrigor's spectacle method has the advantage that it may be used in patients confined to bed. It is, furthermore, mathematically accurate. The main disadvantage is that for the inexperienced it involves the technical difficulties incident to a high degree of accuracy. The "false-eye" method accurately localizes the foreign body, but exact positioning is difficult and a good stereoscopic sense is necessary.

Injuries of the orbital region may be classified as: (a) wounds affecting the globe, with and without radiological demonstration of foreign bodies; (b) wounds involving the bony orbit, including fractures due to gunshot wounds and closed fractures.

The bizarre fractures produced by high-velocity missiles in the long bones may be reproduced in the orbital walls. Any type of fracture may be found. Fractures involving the roof of the orbit are frequently associated with fractures of the base of the skull. Fractures of the medial wall generally involve the orbital plate of the ethmoid, while fractures of the lateral wall and the base are often associated with fractures of the facial bones. The importance of fractures of the floor of the orbit, from an ocular standpoint, lies in the possible displacement of the globe, with resulting diplopia.

SYDNEY J. HAWLEY, M.D.

Symmetric Defects in the Lower Lids Associated with Abnormalities of the Zygomatic Processes of the Temporal Bones. Irving H. Leopold, J. Francis Mahoney, and Mabel Lee Price. *Arch. Ophth.* 34: 210-214, September 1945.

Three cases of symmetric defects in the outer third of each lower lid, with roentgen evidence of absence of

the zygomatic processes of the temporal bones, occurring in a grandparent, mother, and daughter, are recorded. The ancestral history of these patients suggests that the defect was hereditary and that the trait is a dominant one. Roentgenograms and photographs are reproduced.

Deafness with Undeveloped Mastoid and Normal Tympanic Membrane. Fordyce Johnson. *Arch. Otolaryng.* 42: 174-177, September 1945.

During the examination of Army personnel for hearing defects, a number of men were seen with deafness of varying degrees, of undetermined cause, with normal external ear, ear canal, and ear drum. Roentgenography in these cases showed underdeveloped or undeveloped mastoids on the affected side. It is believed that this condition is the result of an infectious process during the developmental period of the mastoid. Three cases are presented.

The author concludes that deafness dating from early childhood in the presence of a normal tympanic membrane should be checked by roentgenograms of the mastoid.

THE CHEST

Family Histories in Tuberculosis. S. E. Simpson. *Am. Rev. Tuberc.* 52: 231-247, September 1945.

Examination of contacts offers an interesting and profitable method of discovering new cases of pulmonary tuberculosis. The results of such a study in five groups of families are presented. The first group consisted of a single family in which tuberculosis involved one person in each of three succeeding generations. In the second group, a family consisting of 28 members, the history of tuberculosis could be traced for eighteen years. The disease apparently remained limited to the family, of which 14 members showed infection either by positive Mantoux reactions or active tuberculosis. In the third group there was involvement of two families unrelated except through contact of one individual in the first with a member of the second. In the fourth group the disease had spread beyond the confines of a family group by direct contact with others. The last group was the most complex of all, nine families being involved, five of them related by marriage and four only by contact with some of the first five. The report emphasizes the difficulties, not in getting the contacts to the clinic, but rather in persuading patients with newly discovered cases to accept sanatorium care.

L. W. PAUL, M.D.

Bronchography in Pulmonary Tuberculosis. Thoracoplasty. B. A. Dormer, J. Friedlander, and F. J. Wiles. *Am. Rev. Tuberc.* 52: 145-154, 258-263, August and September 1945.

As part of a series on bronchography in tuberculosis, the two-part article listed above deals with the uses and value of iodized-oil studies before and after thoracoplasty. In the authors' experience, the results of thoracoplasty are unpredictable. This is chiefly due to the fact that bronchial block and bronchiectasis are almost always present even in early stages of tuberculosis.

While cavities can be obliterated by thoracoplasty, the bronchiectasis remains. This may or may not give rise to a persistently positive sputum, but why some patients with extensive residual bronchiectasis have tubercle bacilli in the sputum and others do not is unknown. The only type of case that seems satisfactory for thoracoplasty is the one with a relatively early apical cavity. Here there may be no demonstrable bronchiectasis. In all others the success or failure of the procedure is completely unpredictable. In the first part of the paper a group of successful cases is reported. It is shown by bronchography that, even in these, persistent and often widespread bronchiectasis may be present and that a large amount of previously healthy lung must frequently be sacrificed in order to arrest the disease.

L. W. PAUL, M.D.

The Chest X-Ray in War Time Industrial Examinations. William L. Bonnet. J. M. Soc. New Jersey 42: 253-261, August 1945.

The importance of roentgen studies of the chest in pre-employment examinations for industrial groups is again emphasized. The author sets forth the advantages of the photoroentgen method and gives the technical factors and processing procedure in some detail. Stereoscopic 4 by 5-inch films made with a rotating anode tube and a grid were found to give a high degree of diagnostic accuracy.

Patients are classified as follows:

Class A: Employable and not requiring x-ray recheck. This group includes cases of arrested minimal tuberculosis, thoracic deformities, rib deformities, cervical ribs, spinal deformities, eventration of the diaphragm, foreign bodies, dextrocardia, enlarged heart, aneurysm, azygos lobe, emphysema, and calcified pleura.

Class B: Employable pending x-ray and/or clinical recheck. Under this head are cases with apical capping with underlying parenchymal lesion, minimal exudative tuberculous lesions, minimal to moderate fibro-productive tuberculous lesions, fibrotic tuberculous lesions, some pneumothoraces (if under care of family doctor), incompletely resolved virus pneumonia, hilar adenopathy, tumors, effusion, generalized fibrosis, bronchitis, pleurisy, thoracoplasty, and pneumoconiosis.

Class C: Not employable. This group includes those with cavitation or other evidence of active tuberculosis, tuberculous effusion, pneumothoraces not in Class B, oleothoraces, and cases in Class B found unstable on additional examinations.

[This appears to the abstractor to be a very liberal classification of employable personnel, probably justified during wartime and with the special facilities available at the author's installation for using the services of the partially incapacitated.]

Approximately 20,000 chest radiographs were made by photoroentgen methods in less than a year. Over 95 per cent of all those receiving pre-employment examinations were immediately put in Class A. About 4 per cent were put in Class B, and 0.24 per cent in Class C. The corresponding figures in a survey, on a voluntary basis, of employed personnel were 90 per cent, 9 per cent, and 0.96 per cent.

Included in this article is an excellent review of the diagnostic features of the various stages and types of tuberculosis with an extensive differential diagnostic listing.

BERNARD S. KALAYJIAN, M.D.

Ulcerative Tracheobronchitis Following Atypical Pneumonia. Report of Cases. Earle B. Kay. Arch. Int. Med. 76: 93-101, August 1945.

Twenty-nine of 150 patients examined bronchoscopically at an Army hospital during the first six months of 1944 were found to have ulcerative lesions of the tracheobronchial tree. In 6 patients the lesions were secondary to tuberculosis; in 4, to bronchiectasis, and in 3 they were associated with pulmonary abscesses. One patient had blastomycosis and one Boeck's sarcoid; in 5, the cause of the lesions could not be determined. In the other 9 cases, the ulcerative tracheobronchitis appeared to be secondary to previous attacks of atypical pneumonia, and it is with these cases that this paper is primarily concerned.

Ulcerative tracheobronchitis associated with atypical (viral) pneumonia may be indistinguishable bronchoscopically from similar superficial ulcerations due to Boeck's sarcoid, from the chronic infective granulomas, and from the bronchomycoses. Early or superficial ulcerative tuberculous tracheobronchitis most closely simulates the ulcerations following atypical pneumonia, although it tends to be even more chronic and resistant to therapy. Laboratory studies in these diseases, however, usually establish the diagnosis.

Four cases of tracheobronchitis secondary to atypical pneumonia are presented in detail. These are characteristic of the group as a whole and illustrate the various clinical, roentgenographic, and bronchoscopic aspects. Each of the patients had two to four previous episodes of atypical pneumonia, all followed by chronic productive bronchitis and general debility. Hemoptysis occurred in three patients. The first case illustrates migratory atypical pneumonia followed by bilateral ulcerative tracheobronchitis, with bronchographic evidence of cylindric bronchial dilatation. The second case is similar but emphasizes atelectasis. The third case was complicated by bronchostenosis and obstructive emphysema. In the fourth, there was ulcerative bronchitis with no roentgenographic evidence of pulmonary residua.

The treatment of ulcerative tracheobronchitis due to atypical pneumonia is discussed. Roentgenograms are reproduced.

Measles-Pneumonia (with a Note on the Giant Cells of Measles). George Milles. Am. J. Clin. Path. 15: 334-338, August 1945.

Pneumonia occurs so commonly in measles and assumes such a characteristic form that it should be looked upon as an integral part of the disease rather than as a more or less accidental complication. The pulmonary lesion of measles results from extension of the lesion of the mucous membrane along the bronchial tree to the finer ramifications. The partial obstruction of the smaller passages by desquamated epithelium and mucus leads to conversion of the process from a catarrhal inflammation, characteristic of the larger air passages, to a purulent process. Extension into the peribronchiolar tissues and into the neighboring alveoli results in a bronchopneumonia, which may be disseminated and discrete or may become confluent. In either instance the pneumonia is specific if one may interpret the presence of even a rare Alagna giant cell, with its bare agglomeration of eight or more nuclei, as specific for measles. The roentgenogram of the disseminated process is not unlike that obtained in miliary tuberculosis or, rarely, in atypical pneumonia.

Two cases of measles-pneumonia in adults, with roentgen and necropsy findings, are presented.

Coccidioidomycosis in Southern California: Report of a New Endemic Area with a Review of 100 Cases. Forrest M. Willett and Alvin Weiss. *Ann. Int. Med.* 23: 349-375, September 1945.

► The authors report a series of 100 hospitalized cases of pulmonary coccidioidomycosis from a new endemic area in Southern California, a roughly triangular desert region bounded by Needles and Banning, Calif., and Yuma, Ariz. The patients were soldiers who had been assigned to this area and were about equally divided between the white and black races. The disease was found to be of greater severity in the colored group.

The authors discuss in rather full detail the various phases of coccidioidomycosis as observed in this series and report several illustrative cases, including one with autopsy findings. Roentgenographic findings were of great value both in diagnosis and in following the course of the disease. For these, reference is made to the papers of Carter (see *Radiology* 38: 649, 1942) and others.

Primary Bronchopulmonary Aspergillosis, an Occupational Disease. George C. Coe. *Ann. Int. Med.* 23: 423-425, September 1945.

A case of primary bronchopulmonary aspergillosis is reported, believed to be the first in the history of this country to come before the Industrial Commission of a sovereign state and to be declared an occupational disease, legally compensable.

The patient was a man of 47, with symptoms of ten years' duration—cough, dyspnea, and weakness. The cough had always been productive, occasionally of a black, streaked sputum, but had never been associated with hemoptysis. The patient had been employed at the Union Stock Yards, in varying capacities, for approximately twenty years. His work at all times brought him into intimate and prolonged contact with animals and with heavy concentrations of dust, including that of hay, grain, corn, and straw.

A florid cyanosis and audible rhonchi were evident at least 5 feet from the patient. The superficial veins of the anterior thorax were prominent, and a bilateral respiratory lag was noted. The heart was not enlarged; blood pressure was 115 mm. Hg systolic and 80 mm. diastolic; pulse 110 per minute.

Roentgen examination of the lungs showed emphysema with increased pulmonary linear striations, especially on the left side; adhesions of the left diaphragm near the cardiac apex; pleural thickening in the upper chest on both sides, especially the left; and massive lung root shadows, especially on the right.

Sputum examination and cultures were made and a typical *Aspergillus fumigatus* was isolated. The tuberculin patch test was definitely positive and a scratch test for *Aspergillus fumigatus* was questionably positive.

The history, physical examination, and roentgen-ray study were indicative of a far-advanced pulmonary fibrotic condition with pleural and bronchial involvement.

Molds of the genus *Aspergillus* are regular inhabitants of soil and are frequently isolated from cereal products, unmilled grain, hay, and other stock feeds, the spores being mingled with grains, seeds, and flour. *Aspergillus*

fumigatus is the most common offender in infections of the bronchopulmonary tissue. The principal factor in the pathogenesis of the disease seems to be exposure to repeated massive doses. In such instances, the condition may be primary without any preceding pulmonary disease.

STEPHEN N. TAGER, M.D.

Putrid Pulmonary Abscess Without Foul Sputum (Shut-off Pulmonary Abscess). Daniel Stats and Harold Neuhoef. *Arch. Int. Med.* 76: 154-160, September 1945.

The early appearance of fetid sputum establishes the diagnosis in about 95 per cent of cases of acute putrid pulmonary abscess. In the remaining 5 per cent, foul sputum either does not appear at all or is found much later than usual, presumably because of occlusion of the communicating bronchus as the result of an inflammatory reaction. On the basis of this assumed mechanism, the term shut-off pulmonary abscess seems appropriate for such cases. Absence of drainage through the bronchial tree favors spread of the abscess to the pleura. Pain in the chest is a more frequent and persistent symptom in these cases than in draining pulmonary abscesses. It is often apoplectic in suddenness and severity and is incapacitating. Once established, it tends to persist for days or weeks. Cough and expectoration are minimal or absent. Physical examination is not of decisive diagnostic assistance.

The densities and rarefactions seen on the roentgenogram in cases of shut-off abscess may be difficult to interpret. They are of no aid in differentiating between a putrid and a non-putrid infection. When the pulmonary lesion is small, its roentgenographic counterpart is relatively insignificant. In one of the authors' cases nothing more than a small area of pulmonary infiltration was observed. In another, in which a large abscess was subsequently demonstrated, an extensive subapical density with the characteristics of a tuberculous or neoplastic infiltration was seen. A fluid level in an abscess cavity usually means a fairly free communication with a bronchus. In most cases of shut-off abscess, the complicating pleural involvement obscures or modifies the pulmonary shadow to such a degree that it becomes unrecognizable in the films. The familiar shadows of a localized or total pleural effusion or hydropneumothorax may be seen. The presence of multiple fluid levels usually means a loculated pyopneumothorax. The roentgen picture in cases of intrapulmonary or interlobar pyopneumothorax is often difficult to interpret. In such instances the general impression is that of a large pulmonary abscess with a fluid level. In all cases of suspected putrid pulmonary infection, lateral and oblique views of the thorax should be made. Occasionally sectional roentgenograms are necessary for correct interpretation and accurate localization of the lesion.

Operation is imperative for the shut-off pulmonary abscess. In 2 of the 10 cases summarized here, operations were not performed, in one because the expectoration of foul sputum on one occasion after four weeks of mild illness represented the evacuation and spontaneous subsidence of a small abscess and in the other because the diagnosis was not made. In this series, there were 2 deaths, 1 of which was avoidable. There are grave dangers inherent in a long delayed diagnosis, but there is a likelihood of a correct diagnosis if the possibility of the lesion is borne in mind. The excellent

results achieved by adequate operations on the pulmonary abscess, as well as on the complicating empyema which is often present, provide an additional incentive to establish the diagnosis of shut-off putrid pulmonary abscess.

Interlobar Effusion Associated with Congestive Heart Failure. S. Boharas and Leo H. Crip. *Ann. Int. Med.* 23: 426-431, September 1945.

A case is recorded to illustrate the unusual finding of interlobar effusion in congestive heart failure unassociated with fluid in the pleural cavity. Only 14 such instances were found in a review of the literature. Necropsy in several of the reported cases showed that fluid collected in the interlobar space either because of local adhesions or an adhesive pleurisy which obliterated the entire pleural cavity with the exception of the small space between the lobes of the lung. The cause of the adhesions in one case was a healed tuberculous lesion; in the others it was unknown.

Interlobar effusion may be associated with any type of cardiac disease, the prerequisites being congestive heart failure and an antecedent adhesive pleurisy. Clinically, there are no significant signs or symptoms. Diagnosis, therefore, rests upon the characteristic roentgen shadow. The site of the effusion determines the location of the shadow, and its size and shape depend upon the amount of fluid present and the degree of compression of the adjacent lung. Interlobar effusion usually causes a dense, sharply demarcated, homogeneous shadow. It may be round, oval, spindle-, wedge-, or band-shaped. The margins are sharp unless there is thickening of the adjacent pleura or disease in the adjacent lung.

The roentgen shadow of interlobar effusion may simulate the appearance of interlobar empyema or of bronchiogenic carcinoma, metastatic neoplasm, pulmonary infarction, pneumonia, gumma, or a localized caseating lesion situated in the region of the interlobar septum. The differential diagnosis will depend upon (1) the general clinical picture, (2) careful roentgen examination, and (3) response to therapy. A lateral view of the chest may be necessary in differentiating an intrapulmonary lesion from interlobar effusion. Interlobar effusion due to heart failure will diminish or disappear shortly after the administration of a mercurial diuretic or an adequate amount of digitalis. The shadow is likely to reappear with the reaccumulation of fluid in the body.

STEPHEN N. TAGER, M.D.

Spontaneous Hemopneumothorax: Report of a Case Occurring in a Soldier. John Franklin. *Ann. Int. Med.* 23: 437-441, September 1945.

The apparent rarity of spontaneous hemopneumothorax led the author to report the following case.

The patient was a 23-year-old soldier, complaining of severe right upper abdominal and right anterior chest pain which radiated to the right shoulder. Chest roentgenograms made on induction, a year before, were reported clear. The temperature on admission was 100°, pulse 110, respirations 30, blood pressure 90/70 mm. Hg. The skin was a sallow yellow color, and the mucous membranes were pale. Respirations were rapid, labored, and shallow, and the patient held his right side as he breathed. There was no cough. In the upright position, flatness to percussion was present

from the eighth rib downward posteriorly on the right. Breath sounds and vocal and tactile fremitus were absent over the entire right chest.

A chest roentgenogram confirmed the clinical impression of a hydropneumothorax. A complete collapse of the right lung, with a fluid level approximating the eighth rib posteriorly, was demonstrated. The trachea and heart were displaced to the left, and herniation of the mediastinum had occurred. A diagnostic thoracentesis resulted in the removal of air and blood under pressure. Approximately 700 c.c. of air were removed and 25 c.c. of blood with a red cell count of 3,160,000 and a white cell count of 6,900. With the removal of air from the right chest, the patient experienced immediate relief of respiratory distress, and a noticeable shift of the mediastinum toward the midline occurred.

On alternate days beginning on the third hospital day, four subsequent thoracenteses were performed, with removal of a total of 2,700 c.c. of grossly bloody fluid showing a decreasing red cell count from 3,160,000 to 510,000 and a rising relative eosinophil count from 18 per cent to 43 per cent. The fluid white cell count never rose above 9,850. In each instance the fluid obtained was sterile. Search for acid-fast bacilli was made and none was found.

Serial chest roentgenograms showed a decreasing fluid level and progressive re-expansion of the right lung. The lung at the last examination had entirely re-expanded, the costophrenic angles were clear, and there were no parenchymal changes to suggest pulmonary tuberculosis.

Although the equilibrium of increased pleural pressure and lowered blood pressure is probably effective in controlling bleeding, the respiratory embarrassment and incipient circulatory collapse occasioned by the acute and massive loss of blood in this case, plus the marked mediastinal displacement, forced the author to relieve the pleural tension and replace the blood loss. It is difficult to estimate accurately the acute blood loss. As the patient's body weight was about 57 kg., the loss was probably in excess of 30 per cent of the total blood volume, which is considered the limit beyond which the physiologic mechanisms of replacement fail. At the time of the first thoracentesis no clinical or roentgenographic evidence of continued bleeding was present.

This case falls into the category of those variants in the clinical picture of hemopneumothorax in which the signs and symptoms are referred to the abdomen. Right upper quadrant pain and tenderness, radiation of pain to the right shoulder, nausea and vomiting, and the yellow pallor suggestive of icterus were confusing features.

The pathogenesis of the hemopneumothorax was not determined. No evidence of tuberculosis could be found. The presence of ruptured emphysematous blebs has been observed in several cases which have come to the autopsy table, and pleural bullae also have been demonstrated radiologically. These constitute a ready source for the escape of air into the pleural cavity and one needs but postulate the presence of a valve vesicle to explain a tension pneumothorax. The source of the bleeding may well be from the ruptured vesicle itself, as these bullae are richly vascularized. A more likely possibility is that bleeding results from an adhesion torn by the traction of the collapsing lung.

STEPHEN N. TAGER, M.D.

Roentgenographic Study of the Postero-Inferior Pleural Boundaries Preceding Renal Surgery. Ernest Lachman. *Urol. & Cutan. Rev.* 49: 463-467, August 1945.

For the urological surgeon the postero-inferior extent of the pleura is of great importance. In its inferior extent it is overlapped by the upper poles of the kidneys and is thus liable to injury in renal surgery, with the production of an accidental pneumothorax.

The posterior inferior pleural border is seen in a dorsoventral roentgenogram as a line running either horizontally or with medial ascent or downward convexity from the lateral thoracic wall toward the spinal column. This line, representing the posterior costo-diaphragmatic reflection of the pleura, may occur anywhere from the level of the twelfth dorsal to the lower margin of the second lumbar vertebra. It is best demonstrated with the patient prone, in deep inspiration. Variations in the form and position of the pleural line are considerable. The downward bulge of the postero-inferior pleura, in particular, may be much lower than one would assume from anatomical descriptions. In extreme instances, unless this has been demonstrated roentgenologically, the surgeon may open into the pleural cavity. In addition to locating the lower boundary of the pleural sac, an abdominal film with the patient prone will furnish information as to the size of the twelfth rib. When the latter is rudimentary, the eleventh rib may be mistaken for the twelfth, with a consequent distortion of the topographical anatomical picture.

MAURICE D. SACHS, M.D.

Electrokymograph for Recording Heart Motion Utilizing the Roentgenoscope. George C. Henny and Bert R. Boone. *Am. J. Roentgenol.* 54: 217-229, September 1945.

That each chamber of the heart and associated great vessels has its characteristic motion, and that this motion is characteristically altered in the presence of cardiovascular disease, has been well established. The permanent graphic recording of this motion is a goal long desired and sought for. It is believed there will be a substantial gain in the clinical information furnished by the analysis of heart motion. The records obtained by means of the electrokymograph described here overcome past difficulties encountered in the analysis of the roentgen kymogram, in producing a large, beam type, or electrocardiographic type tracing of a chosen point on the cardiac silhouette on bromide paper, of as many consecutive cardiac cycles as may be desired.

Under the roentgenoscope the roentgen-ray beam is restricted to a narrow rectangular area with its long dimension placed so as to be at right angles to the particular portion of the heart border under investigation. The heart border will appear to move across this rectangle. A 931-A multiplier phototube is placed over this area. The roentgen-ray beam is channeled through a lead diaphragm system which restricts the rays striking a strip of fluoroscopic screen, which in turn activates the phototube in varying intensities produced by the motion of the heart border. The emitted current is greatly amplified in the tube and further by an amplifier which then operates a recording galvanometer. The observer aligns the 931-A diaphragm by means of the fluoroscopic screen. The amplifier is described in considerable detail. The recording galvanometer is of the permanent magnet d'Arsonval type,

such as is used in electrocardiography. A recording of the right carotid pulse is made simultaneously on each patient and registers on the film below the heart motion tracing.

The electrokymograph has these advantages over the roentgen kymograph: (1) It records a single point of motion at one time. (2) It records as many successive cardiac cycles of this point as may be desired. (3) It produces amplitudes on the record up to 20 mm. or more by amplifier adjustment. (4) It records wave forms on the record which are sharply defined and easily read. (5) It shows the "radial motion" of a point and not merely its horizontal component because the aperture of the unit containing the phototube is placed roentgenoscopically at right angles to the border of the heart under examination.

Records of motion from various parts of the heart border are presented in the text and their interpretation is discussed. With alterations in character of the myocardium, or defects of the valves, there will be corresponding alterations on the limbs of the curves produced on the electrokymographic record.

CLARENCE E. WEAVER, M.D.

A Roentgen Cinematographic Study of the Movements of the Mitral Ring During Heart Action. Henning Odqvist. *Acta radiol.* 26: 392-396, June 30, 1945.

Odqvist reports a roentgen cinematographic study of a woman of 76, who for some years had shown signs of cardiac sclerosis. Following study of the heart under routine fluoroscopy, he made a powerful exposure over a period of three seconds at 100 kv. and 100 ma, using a specially constructed fluorescent screen of high luminosity. During this time the cinematographic exposures were made with a 16 mm. camera fitted with a Zeiss Optik, Roentgenbiotar, f 0.85 objective, on Cine Kodak film XX; 16 as well as 32 exposures a second were made. The point is stressed that the registering of intracardiac calcifications and their movement approaches the borderline of present-day technical achievement. "Only where the patient is very lean and the calcareous deposits considerable can success be expected."

The movement curve of the calcified mitral ring during heart action is described as triangular. During ventricular systole, the movement of the ring is vertically downward in the direction of the diaphragmatic cupola. Just before reaching its lowest position it moves with a jerk toward the apex of the heart. Diastole produces a returning movement along the hypotenuse of the triangle, at the upper part of which the deposit stops and appears to vibrate. This is followed by a quick return to the original position at a speed considerably greater than the other movements, which is presumed to represent the presystolic phase.

The author raises the question whether the described movements constitute a physiological phenomenon or whether they should be considered as a sign of uncoordinated contractions of the heart muscle due to perimital calcification extending into the surrounding myocardium or to coronary disturbance, both of which were known to be present. VICTOR KREMENS, M.D.

Unusual Primary Leiomyosarcoma of the Heart. Burt Friedman, Ernest E. Simard, and Irving Schwartz. *Am. Heart J.* 30: 299-308, September 1945.

The authors give the case history of a 35-year-old soldier with a primary tumor of the heart with an intra-

pericardial metastasis. Symptoms first appeared while the patient was on a hike, from which he had to drop out. Three days later he was hospitalized and a diagnosis of pericarditis was made. Three weeks after this, at a station hospital, the cardiologist made a provisional diagnosis of pericarditis subsequent to an acute arteritis with myocardial infarction.

Several roentgen studies showed a progressive enlargement of the heart. The transverse diameter increased from 15.5 cm. to 21 cm. in three months. In the beginning the enlargement was limited to the left ventricular apex and weak pulsations were observed in that area. Within a month, feeble pulsations only were observed over the entire left ventricular border.

About three months after the onset of symptoms, the patient became orthopneic. A short, sharp, harsh systolic aortic murmur was heard. The heart rate was 100. Mild cardiac decompensation was apparent clinically. Dependent pitting edema developed, and the sclerae showed an icteric tinge. At this time, a chest film showed the left border of the heart to be in contact with the axillary chest wall, with apparent displacement of the heart to the right, and displacement of the lower end of the trachea and right main bronchus.

The original EKG showed evidences of pericarditis with possible myocardial infarction. Subsequent EKG's showed persistent evidences of myocardial damage. The final clinical diagnosis was "massive aneurysmal dilatation, left ventricle, probably on the basis of myocardial infarction, with subsequent myocardial failure."

Approximately four and a half months after onset of symptoms, the soldier died. Postmortem examination showed the extreme cardiac enlargement, which involved primarily the left ventricle, to be due to a mass which extended half way around the heart by intracardial growth *en cuirasse*. Its exact site of origin could not be determined but was thought to be in or near the apex of the left ventricle. The cavity of this ventricle was reduced in size, and two polypoid masses were present in its apical portion. The right ventricle was hypertrophied but was not invaded by tumor tissue. Another mass, measuring 2.2×4.5 cm., surrounded the base of the aorta, producing some compression on the superior vena cava as it entered the right auricle. This periaortic mass was entirely extramycardial and had no connection with the main tumor. It was thought to be an intrapericardial metastasis. Microscopic sections of the tumor tissue showed a spindle-cell type growth, believed to be leiomyosarcoma.

An antemortem diagnosis of tumor was suggested in this case but discarded in favor of aneurysm. In retrospect, the authors feel that the latter diagnosis should have been excluded for the following reasons: (1) the presence of a friction rub for ten days is unusual in a case of simple single infarction; (2) there was no drop in blood pressure; (3) the EKG changes were not typical; (4) there were no clinical or other laboratory data to support secondary infarction to account for the progressive nature of the EKG findings; (5) the rapid enlargement of the heart, coupled with the rapid course, should have pointed to tumor as the more probable diagnosis.

HENRY K. TAYLOR, M.D.

Anomalous Right Subclavian Artery. Benjamin Copleman. *Am. J. Roentgenol.* 54: 270-275, September 1945.

A review of the embryological and anatomical features of anomalous right subclavian artery is given.

The site of origin of the anomalous vessel is most often the posterior aspect, and only rarely the superior wall of the aorta. Since the anomalous artery arises on the left as the fourth rather than as the first or part of the first main trunk, it must cross the spine to reach the right arm. It usually runs between the esophagus and the spine, and its course is upwards, as well as to the right. Patients with right subclavian artery anomaly occasionally complain of dysphagia. Because of pressure on the artery there may be inequality of the radial pulses.

Roentgenologic examination of the patient while he swallows a barium meal shows an indentation of the esophagus posteriorly by the anomalous artery. This is the sole diagnostic clue. The defect is concave to the left and is at or above the level of the aortic arch. The esophageal defect produced by a right aortic arch is almost the same as that due to an anomalous right subclavian artery. The aortic anomaly displaces the esophagus to the left and anteriorly. The demonstration of a normally pulsating aortic arch, which is not in contact with the esophageal defect, at the left side of the vertebral column, must be made in order to arrive at the true diagnosis.

A case presenting the characteristic defect of anomalous right subclavian artery is described.

CLARENCE E. WEAVER, M.D.

THE DIGESTIVE SYSTEM

Peptic Ulcer in a Naval Hospital, 1944. Some Roentgenologic Findings. L. Henry Garland. *Stanford M. Bull.* 3: 114-120, August 1945.

General medical conceptions as to the incidence and diagnosis of peptic ulcer are based largely on civilian experience. The author, on the basis of his observations in naval hospitals, believes that some revision of prevailing opinions is called for. He analyzes here a group of 1,000 cases in young patients (average age 26 years) with short histories (many less than two years). The ratio of gastric to duodenal ulcer in this group was approximately 1 to 24. As given in the literature the ratio ranges between 1 to 3 and 1 to 50.

The diagnosis of peptic ulcer is made from (a) the clinical history, (b) the laboratory findings, and (c) the roentgenologic or gastroscopic demonstration of the lesion. The most important diagnostic procedure is the roentgenologic. The demonstration of a crater is the only definite x-ray evidence of an active ulcer, either gastric or duodenal.

As to the significance of bulbar deformity without a niche, the author believes that, if the patient has had no previous upper abdominal surgery and the deformity is constant, there is a 95 per cent probability that it is due to ulcer or to scarring ("healed" ulcer). A single examination showing deformity is not proof of an active ulcer; deformity visible on repeated examination is indicative of ulcer, active or healed.

The author asks: Can healing of a peptic ulcer be reliably diagnosed by x-ray examination? In the case of most gastric lesions, his answer is, "yes." In about one-half of the cases of duodenal ulcer, he believes the answer is, no. Many authorities have held that, once a duodenal ulcer is present, the bulb will never be smooth again. However, the author has seen many young men with normal appearing duodenal bulbs who a few months previously had unequivocal craters, 2 to 5 mm. in diameter. He believes, therefore, that the old state-

ment that healed duodenal ulcer "typically shows some contraction" no longer holds.

The findings relative to uncomplicated peptic ulcer in the 1,000 consecutive upper gastro-intestinal examinations constituting the basis of this paper were as follows:

Unequivocal x-ray diagnoses of ulcers.....	321
Gastric ulcers.....	13
Duodenal ulcers.....	308
With definite craters.....	164
With probable craters.....	24
Without visible crater.....	120

It is of interest to note that craters were demonstrable in 61 per cent of the duodenal lesions.

In order to determine the consistency with which duodenal ulcer can be diagnosed by different members of a radiological staff, a group of cases which had been examined by different radiologists was reviewed. In 150 consecutive cases, Dr. A. diagnosed duodenal ulcer in 28 per cent and Dr. B. in 30 per cent. In only 6 cases were reports at direct variance. Three of these differences may be written off as attributable to the natural history of the disease (that is, an interval of about six weeks occurred between examinations); the other three probably represent errors or oversight. The consistency and accuracy with which duodenal ulcer can be diagnosed appear, therefore, to be excellent in experienced hands.

In the x-ray diagnosis of duodenal ulcer the reliability of the various criteria is estimated as follows:

- (1) Niche: Active ulcer in 95% of instances
- (2) Deformed bulb: Active or healed ulcer in 95% of cases (provided there has been no previous operation on the duodenum)
- (3) Smooth bulb (with and without compression): No ulcer in first portion of duodenum in 95% of cases
- (4) Deformed bulb, inconstant or without niche: Usually due to incomplete filling, with pylorospasm, etc. Occasionally due to duodenitis with or without shallow erosion

Since many clinicians believe that an x-ray report of duodenal ulcer means or implies active ulcer, the author believes that qualification of the report should be attempted, along the following lines:

- (1) Duodenal ulcer, with visible crater
- (2) Duodenal ulcer, with questionable crater
- (3) Duodenal ulcer, with no crater visible, deformity typical, presumably active
- (4) Duodenal bulb deformity, probably scarring from healed ulcer
- (5) Duodenal bulb deformity, probably surgical
- (6) Duodenal bulb deformity, probably extrinsic
- (7) Negative

The author emphasizes the importance of a standard procedure for the determination of partial pyloric obstruction which may complicate a juxtapyloric ulcer, and recommends barium sulfate (4 oz. by weight) in water (8 oz. by volume) at room temperature. He notes, in passing, that barium is often incriminated as a cause of intestinal obstruction when in fact it is merely a concomitant of a pre-existing or incipient fecal impaction attributable to faulty diet or medication in a dehydrated patient (aluminum hydroxide may produce hard, white colonic masses which resemble and may be

miscalled barium lumps when viewed with the naked eye).

The data on the consistency of reports of ulcer or absence of ulcer by different radiologists are of considerable interest and should be studied in the original article.

SYDNEY F. THOMAS, M.D.

Gastrojejunalocolic Fistula. Henry K. Ransom. *Surgery* 18: 177-190, August 1945.

Of 47 patients operated upon for gastrojejunal ulceration at the University of Michigan Hospital in a ten-year period (1934-44), 8 (17 per cent) had a complicating gastrojejunalocolic fistula. The number of such complications diagnosed since the opening of the hospital, in 1925, was 18, in 14 of which operation was done.

Gastrojejunalocolic fistula is almost invariably a late complication of a marginal or jejunal ulcer developing at the site of a gastro-enteric anastomosis for duodenal ulcer. The great majority of cases occur after posterior gastrojejunostomy, usually following a simple short-circuit operation rather than in gastrojejunostomy associated with partial gastric resection. In the 18 cases forming the basis of this report, duodenal ulcer was the initial lesion in all. Marginal ulcer rarely occurs following gastroenterostomy for gastric ulcer and is almost unheard of after gastroenterostomy for carcinoma of the stomach. The exact cause of marginal or jejunal ulcer is not known, but it is believed to develop more frequently in those patients in whom gastric acidity remains high following operation.

The interval between the original operation and hospital admission for fistula varies. The extremes in the present series were one year and twenty-six years, with an average of nine and a half years.

Clinical diagnosis of gastrojejunalocolic fistula is ordinarily not difficult, and in the author's series was made correctly in all except one instance. Symptoms due to the recurrent ulcer may or may not precede the typical symptoms of fistula. Of the latter, diarrhea is the most prominent and distressing and is chiefly responsible for the weight loss and the debilitated state of the patient. Vomiting is probably the second most important symptom. It is often described as fecal but is not actually stercoraceous as in small bowel obstruction. Pain is usually present in those patients with evidence of marginal ulcer prior to the onset of fistula symptoms. It is more severe and less responsive to medical treatment than the primary ulcer pain and is often situated to the left of and slightly below the umbilicus. Obstruction may occur in the colon at the site of the perforation and the symptoms may then be those of bowel obstruction. In other instances the small bowel may be obstructed as a result of adhesions around the inflammatory mass at the site of the fistula. An anemia of moderate degree is usually present, and serum protein determinations are likely to be below normal.

Roentgen studies with the aid of the barium meal and barium enema are undoubtedly the most important means of proving the presence of a gastrojejunalocolic fistula. The diagnosis is often suggested or made when, following oral administration, barium is seen fluoroscopically to enter the colon promptly. When the fistula is small, however, or if the barium enters the colon slowly, the condition may be overlooked. In 15 of the 18 cases reported here, the fistula was demonstrated roentgenologically.

Due to the cachectic state of the patients, preoperative correction of the nutritional disorders is essential. In all of the author's series a one-stage operation was done. Gastric resection was included in 4 instances; in the remainder the simpler restorative types of surgery with or without pyloroplasty were employed. There were 2 operative deaths, but the last 10 consecutive operations were performed without a fatality. In 3 cases the end-results were excellent and in 4 good. In 5 there was a recurrence of symptoms, and re-operation was required.

A brief discussion of gastrocolic fistulas due to primary disease of the stomach or colon is included, and a small group of gastro-enteric fistulas attributable to surgical errors is presented.

J. E. WHITELEATHER, M.D.

Lesions of Small Intestine Producing Massive Hemorrhage with Symptoms Simulating Peptic Ulcer.

Harry L. Segal, W. J. Merle Scott, and J. S. Watson. *J. A. M. A.* 129: 116-120, Sept. 8, 1945.

The primary purpose of this paper is to emphasize the fact that various lesions of the jejunum or ileum may produce melena and postprandial pain, thus mimicking peptic ulcer. The findings in 9 such cases, 6 of which have been reported previously in the literature, are summarized. Included are 2 instances of benign leiomyoma, 2 of Meckel's diverticulum, 2 of hemangioma, 1 each of carcinoid, benign neurofibroma, and carcinoma.

Of importance to roentgenologists is the fact that the diagnosis was not made by the first x-ray examination in any of these patients. Actually, in 6 different instances there were roentgenologic changes in the duodenal bulb which led to the erroneous conclusion that the symptoms were due to duodenal ulcer.

Careful examination of the small bowel is indicated in any patient who has pain which is somewhat atypical for peptic ulcer and repeated or continuous melena in the absence of hematemesis.

JOHN F. HOLT, M.D.
(University of Michigan)

Roentgen Diagnosis of Jejuno-Ileal Inflammations.

Pedro A. Maissa. *Radiologia* 7: 162-170, July-October 1944.

The roentgen findings in inflammatory lesions of the jejunum and ileum, particularly in regional ileitis and tuberculosis, are described and compared with those in the normal small intestine. The methods used in roentgen examination are discussed and the importance of serial studies is emphasized. The author concludes that roentgenography can determine only the existence, but not the nature, of the disease process.

Diverticulitis of the Jejunum with Perforation.

Michael W. Shutkin. *Gastroenterology* 5: 102-105, August 1945.

The developmental cycle of jejunal diverticula is reviewed. It appears that such diverticula represent sacular hernias of mucous membrane through a gap in the bowel wall at a point where blood vessels enter. When stasis in the sac occurs, diverticulitis and even perforation may result. A survey of the less than one hundred recorded cases of jejunal diverticulosis fails to establish a definite syndrome for the uncomplicated lesion. The more common symptoms are pain, flatu-

lence, borborygmus, and vomiting, the attacks increasing in frequency. Roentgenography is most helpful in the diagnosis of diverticula of the jejunum but is not without shortcomings. The roentgen diagnosis depends upon the demonstration of one or more constant barium shadows of hemispherical outline presenting a fluid level with gas. This is usually observed with the patient in the upright position. Contrary to the prevalent opinion that stasis in the sac is uncommon because of the fluid character and motility of the contents of the gut at this level, retention and impaction occur. This happens not uncommonly with inert substances such as barium sulfate and aluminum silicates, and delays in emptying of from twenty-four to thirty-six hours have been reported.

A case of diverticulitis of the jejunum with perforation, believed to be the first in which a preoperative diagnosis was confirmed at operation, is presented.

Right Paraduodenal Hernia. Frank H. Lahey and William Trevor. *Ann. Surg.* 122: 436-443, September 1945.

The rarity of right paraduodenal hernias is pointed out. Only 2 cases were seen in the Lahey Clinic from 1925 to 1944 and only 2 cases were treated at the Mayo Clinic from 1910 to 1939. The ratio of right paraduodenal hernia to left is 1:3. Fifty cases (including the present 2) have been recorded in the literature; operation was performed in 31 of these, and about half the patients survived.

In right paraduodenal hernia, according to Moynihan, (1) almost all of the small intestine is imprisoned in a peritoneal sac behind the ascending and transverse mesocolon and occupies the right half of the abdomen; (2) the opening of the sac is to the left and near the duodenojejunal juncture at the ligament of Treitz; (3) the superior mesenteric artery or a continuation of it, the ileocolic artery, lies in the anterior portion of the sac.

The 2 cases reported in this paper were not diagnosed roentgenographically, but in retrospect the authors believe the correct diagnosis might have been made in the first case because of the presence of certain roentgenographic features described in the literature (Exner, F. B.: *Am. J. Roentgenol.* 29: 585, 1933. *Abst. in Radiology* 22: 642, 1934): (1) the appearance of the small intestine, as though it were contained in a spherical transparent paper bag from which restricted position it is usually impossible to disturb the intestinal coils by manual palpation or postural change; (2) the location of the intestine well above the true pelvis. In the second case the following points, set forth by Case and Upson (*J. A. M. A.* 87: 891, 1926), should have suggested a correct diagnosis: (1) the normal location of the jejunum on the right side of the abdomen; (2) downward continuation of the jejunum from the second portion of the duodenum; (3) absence of the transverse third and ascending fourth portions of the duodenum traveling to the left across the spine; (4) dilatation of the duodenum as a result of constriction or angulation of the proximal jejunum by the neck of the peritoneal sac.

Diagrams of the operative findings and embryonic development of the intestine clarify the presentation of the subject. The reproductions of the roentgenograms leave much to be desired.

SYDNEY F. THOMAS, M.D.,

Volvulus of the Sigmoid Colon: Report of Twenty-Five Cases. William D. Griffin, George R. Bartron, and Karl A. Meyer. *Surg., Gynec. & Obst.* 81: 287-294, September 1945.

Of 458 cases of intestinal obstruction seen in the Cook County Hospital (Chicago) between 1937 and 1945, 37 (8 per cent) represented volvulus of the sigmoid colon. Twenty-five of these cases for which complete data were available form the basis of this paper.

Volvulus of the sigmoid colon occurs predominantly in males, and the greatest incidence is in middle and advanced life. The authors' cases were of two general types—acute and subacute. The acute cases occurred in the younger age groups; the patients gave an equivocal history of constipation, early transient emesis, generalized cramping abdominal pains, abdominal tenderness, acute distention, and severe prostration. There was a tendency to the early development of gangrene and a fulminating course. Subacute cases were slightly in the majority in this series. These patients were older, and the onset was more gradual, with a history of previous attacks and constipation. Emesis was of late occurrence; gangrene developed slowly and the course was more moderate.

Seventy-six per cent of the patients were unable to take an enema of more than 500 c.c. (the normal capacity in the absence of obstruction is 2 or 3 liters). When the volvulus was incomplete, however, 3,000 c.c. might be introduced in the redundant loop of sigmoid colon, but only a small portion of this amount could be expelled. Since only 24 per cent of the patients showed this valve-like action, however, it is not considered pathognomonic.

The most helpful single aid to diagnosis is the roentgen examination. The typical findings, according to the authors, are a tremendously dilated sigmoid loop situated in the right side of the abdomen; moderate distention of the colon above the volvulus; absence of a collection of fluid within the bowel; an "ace of spades" appearance of the barium enema opacity; and a normal mucosal pattern in the sigmoid and rectum distal to the dilated loop. The authors are not in agreement with Rigler and Lipschultz (*Radiology* 35: 534, 1940) that the presence of an unusual amount of fluid is a diagnostic feature.

The clinical course and response to surgical intervention were quite variable. Simple detorsion, even when possible, did not appear to be the treatment of choice since the volvulus tended to recur. Exteriorization and second-stage resection of the bowel probably gave the best results. R. E. BOOTH, M.D.

Regional Segmental Colitis. Jorge de Castro Barbosa, J. Arnold Bargen, and Claude F. Dixon. *S. Clin. North America* 25: 939-968, August 1945.

The term "regional colitis" is applied to inflammatory, ulcerative, or hyperplastic lesions of cryptogenic origin involving one or more segments of the colon, either as a continuous process or multiple involvement, sparing, however, the terminal portion. The 140 cases constituting the authors' series were seen at the Mayo Clinic in a twenty-year period (1923-43) and represent about 4 per cent of the entire group of cases of colitis observed in that time. While the right side of the colon was more frequently involved than the left, the authors feel that the term "right-sided colitis," sometimes used, is not entirely justifiable, particularly since they exclude all cases with primary involvement of the ileum.

The disease is equally distributed between male and female patients; it is most common in the third and fourth decades but may occur at any age.

The etiology remains undetermined despite numerous studies. No single infective agent has been consistently found as a causative factor. Allergic reactions of the viscera, disturbed function of the visceral sympathetic system, and visceral infarction may all play a part. The experimental focal thrombotic phenomenon produced in the digestive tract by anaphylactic shock may correspond to the areas of "stippling" seen at operation in segments of bowel near inflammatory lesions. The present authors consider the "stippling" as indicating the initial inflammatory lesion and point out that resection should go beyond any "stippled" areas if recurrence is to be prevented.

To classify accurately the location and extent of the lesions in their cases, the authors arbitrarily divided the colon into fourteen small segments from the cecum to the distal sigmoid. They found an average of seven segments involved in each case. The segments of the right half of the colon, as pointed out above, were more frequently involved than those of the left; the transverse colon was more commonly involved than the ascending colon. The proximal segments of the left half of the colon were also a common site of involvement. In 18 per cent of the series there were secondary lesions in the terminal ileum. In the majority of cases, a single short or long continuous inflammatory lesion was present. In four instances, two separate lesions with normal bowel between them were demonstrated. In one case, a patchy distribution was present.

Pathologically the lesions were similar to those of generalized ulcerative colitis with diffuse mucosal ulceration, polypoid hyperplasia, suppuration of the submucosa, thickening and induration of all coats, and chronic infiltration with scarring of the serosa.

Clinically the patient may be in good general condition and complain only of abdominal cramps with an occasional loose stool, infrequently bloody, or there may be an acute illness, with fever, evidence of toxemia and bodily depletion, severe diarrhea, and hemorrhages. There are many variations between these extremes but in general the diarrhea is not severe; the rectal discharges contain little if any pus or blood; cramps are common along the line of the colon and may be relieved by bowel movements. Some evidence of anemia is common, though gross hemorrhages are rare. The sedimentation rate is a good guide to the activity of the disease.

Since the lesions are beyond the reach of the proctoscope and sigmoidoscope, the diagnosis depends almost entirely on the radiologic findings. The fuzzy, distorted and narrowed outline of the involved segments, with evidence of hyperirritability, shortening, and loss of haustration, is characteristic of segmental colitis. Double contrast enemas may add further evidence. Differentiation from carcinoma is not usually difficult unless the involved area is exceptionally short, when it may be impossible to reach a decision from roentgen evidence alone.

Many patients in this group were treated medically with or without sulfonamides. Bed rest, intravenous fluids, blood transfusions, low-residue high-protein and vitamin diets, and other general supportive measures were used. Forty-three patients underwent some form of surgical procedure.

The authors conclude that one must follow these patients for years before a decision can be made as to the efficacy of any form of therapy; that sulfonamides with supportive measures are often effective in obtaining remissions and in preparing patients for surgical intervention; that short-circuiting operations are seldom effective; and that resection of the involved segments is the treatment of choice, with the best chance for permanent cure. BERNARD S. KALAYJIAN, M.D.

Radiological Aspect of Amebic Colitis. J. J. Valarino. *Radiologia* 7: 150-161, July-October 1944.

Roentgenography is of considerable value in the study of amebic colitis, giving information not only as to the location, extension, and seriousness of the intestinal invasion, but also on the course of the infection under treatment. The differentiation of amebic colitis from ulcerative colitis, mucous colitis, tuberculosis, and cancer is discussed.

Roentgenological Diagnosis of Benign Tumors (Single Polyps) of the Colon. Franz J. Lust. *Am. J. Roentgenol.* 54: 276-281, September 1945.

Bleeding from the rectum and intestinal obstruction are the important signs which should lead to a search for intestinal polyps. Most of the polyps are very vascular and therefore easily damaged by hard fecal matter. Obstruction is usually partial. The patient may experience no pain except after taking laxatives or cleansing enemas. In one of the author's cases the pains were localized in the right hypochondrium. The best way to find a polypoid growth of the colon (unless it can be reached by the proctoscope) is by enema. The study of the mucous membrane after evacuation of the barium enema is stressed. Air insufflation is advisable, but interpretation must be made cautiously, as fecal material may be mistaken for a polyp. Careful preparation of the patient for barium enema study is most essential. In the presence of polyps, the regularity of the mucosal pattern is suddenly interrupted. The tumor appears like a cherry or plum in the axis of the colon. For further study a compression device must be used.

The author reports two cases of polyp of the colon which were diagnosed by roentgen study and removed surgically. Another case is described in which a mass resembling a polyp proved, on re-examination, to have been fecal material, demonstrating the value of thorough preparation. CLARENCE E. WEAVER, M.D.

Gallbladder Dye (Iodophthalein Sodium). Effect of Intravenous Injections on Coronary Flow, Blood Pressure and Blood Coagulation. Florence E. Lawson. *Arch. Int. Med.* 76: 143-145, September 1945.

Experiments with the intravenous injection of iodophthalein sodium showed that this dye produces an increase in the coronary flow in dogs, while a drop in the blood pressure was observed in both dogs and human beings. The fall in blood pressure may account for the occurrence of shock in some cases following injection of the dye for gallbladder studies. In patients with sclerotic arteries, the drop in blood pressure may produce enough diminution of coronary flow to result in coronary thrombosis.

While the mechanism of the production of coronary accidents by intravenous injection of gallbladder dye

in persons with coronary arteriosclerosis is not fully explained by the experiments here recorded, it is clear that both blood pressure and coronary blood flow are profoundly affected. Obviously intravenous cholecystography is contraindicated in persons with coronary arteriosclerosis.

Two cases of anaphylactic shock without coronary occlusion and 2 cases in which coronary occlusion occurred after administration of iodophthalein sodium are presented.

THE MUSCULOSKELETAL SYSTEM

Osteogenic Sarcoma and Chondrosarcoma, with Special Reference to the Roentgen Diagnosis. Eugene P. Pendergrass, John O. Lafferty, and Robert C. Horn. *Am. J. Roentgenol.* 54: 234-256, September 1945.

This paper is an attempt to evaluate the difficulties and pitfalls in the roentgen diagnosis of primary malignant bone tumors and to correlate the pathologic findings with the roentgen picture. In 1939 the original Registry of Bone Sarcoma of the American College of Surgeons was revised, one of the principal changes being the recognition of the chondrosarcomas as a distinct group. The authors have followed this revised classification in their series.

Seven cases of osteogenic sarcoma with their histories are presented. Eleven cases in which a diagnosis of chondrosarcoma was established are also described.

Sclerosing osteogenic sarcoma is described as occurring characteristically on the shaft side of the epiphyseal zone and showing mottling due to destruction and sclerosis within the bone. The growth may extend beyond the epiphyseal zone. The cortex is incompletely preserved. The periosteum is raised above or below the tumor, producing periosteal lipping. Spicules of new bone are laid down perpendicular to the cortical surface, producing the "sun-ray" appearance. Osteolytic osteogenic sarcoma manifests itself roentgenographically by a central area of irregular destruction which eventually extends through the cortex. It is asymmetrically located and there is periosteal reaction. The soft tissues may be involved in either type. In many cases the two types are co-existent. Periosteal elevation and lipping constitute one of the earliest signs of osteogenic sarcoma and should be carefully watched for.

Chondrosarcoma may be central or peripheral. The central growths may begin in the medulla or in the cortex. They show large thick-walled cavities tending to destroy the cortex. They occur in the ends of the long bones and perforation of the cortex is a late occurrence. The peripheral tumors show a faintly visible shadow in the soft parts next to the bone, raising the adjacent periosteum. Radiating spicules are often present. These are quite long and show a flattened outer surface as distinguished from those of osteogenic sarcoma, which are shorter and do not become flattened. All cases had one finding in common—spotty flecks of calcification seen in the tumor. It is believed that this is a significant finding in the differential diagnosis of these lesions by the roentgenogram.

Three cases are presented which have the roentgen characteristics of one lesion and the pathologic characteristics of another. These demonstrate that accurate diagnosis cannot always be made from the roentgen examination alone. Other cases which showed lesions of bone having characteristics that might cause them to be confused with osteogenic sarcoma and chondro-

sarcoma were Ewing's tumor, metastatic carcinoma, osteomyelitis, periostitis, and hemangioma of bone. Perpendicular striations may occur in chondrosarcoma, periostitis, and metastatic carcinoma. Before radical surgical treatment is instituted, biopsy should be done and an adequate specimen obtained. Frozen sections are quite often not sufficient. The need for a skeletal survey in all cases of suspicious bone lesion is emphasized.

All of the patients with osteogenic sarcoma in this series were treated by immediate amputation, and all died, the longest survival being twenty-nine months. Four of the eleven patients with chondrosarcoma survived, one for eight years and one for six years. Two others had been treated within the last fifteen months. The differences in the clinical course and survival rate suggest that these two groups of tumors should be separated, as recommended by the Bone Tumor Registry.

CLARENCE E. WEAVER, M.D.

Sarcomatous Change in an Osseous Exostosis. J. Ducuing and P. Marqués. *J. de radiol. et d'électrol.* 26: 20-21, 1944-45.

This case represents what appeared to be an osteochondroma (in the nomenclature ordinarily employed in America) of large size, situated on the scapula. It was followed from 1937 to 1941, when extension and change in form and density led to a biopsy, with the resultant diagnosis of chondrosarcoma.

The authors comment that this is a rather rare development in an osteochondroma, a statement which will find general acceptance, though their publication serves as a reminder that one must not disregard this possibility in considering the many benign osteochondromas which are seen by the average radiologist from time to time.

PERCY J. DELANO, M.D.

Metastases and Neoplastic Dissemination Involving the Osseous System in Cancer of the Cervix. Bonte and Schaffner. *J. de radiol. et d'électrol.* 26: 1-3, 1944-45.

Osseous metastases from carcinoma of the uterine cervix are not frequently observed; Gricouloff found only 25 examples in a series of 2,076 cervical cancers. Fourteen cases have been seen by the authors, all established radiologically or at autopsy. The vertebral column was involved in 6 of the series; the neck of the femur in 4; iliac bone in 2; humerus in 1; tibia in 1; shaft of the femur in 1.

In 9 cases the lesions appeared within six months following treatment; in the remainder an interval of about eighteen months elapsed. As to the form of treatment, all but one of the patients had received radiotherapy; in one, hysterectomy was done.

Age did not appear to be of significance, nor did the histology of the lesions have any constant bearing.

The authors note that in lesions of the spine, the disks were preserved. All of the metastases shown in the illustrations are of the osteolytic type, though one case is said to be of the osteoplastic type, somewhat fenestrated with osteolytic areas.

In most of the cases, the appearance of osseous metastases was a harbinger of early death. In a single case, radiotherapy to the bony lesions had left the patient in a comfortable state, with outward evidence of good health, three and a half years after the lesions appeared.

PERCY J. DELANO, M.D.

Bone Growth in Congenital Myxedema. The Use of Serial Roentgenograms of the Os Radius in Diagnosis and Regulation of Therapy During Infancy. Paul V. Woolley, Jr., and Robert W. McCammon. *J. Pediat.* 27: 229-235, September 1945.

Three cases of cretinism are presented to illustrate the value of roentgen studies of the long bones, both in the diagnosis of athyreosis and in the regulation of therapy in young children. Two features are stressed. First, a hard, densely calcified epiphyseal plate, which is present by the time cretinism is suspected clinically, is as dependable a finding as retardation in the appearance of ossification centers. This plate does not resemble that seen in rickets, scurvy, syphilis, or lead poisoning and has not been encountered by the authors except in films of myxedematous patients. Second, the administration of thyroid substance results in an almost immediate resumption of growth and the appearance of newly calcified bone. Adequate treatment at first produces calcification at a rate greater than average for normal infants; later, growth which parallels the normal curve. Reduction of thyroid intake is reflected by decreased bone growth, and this decrease can be measured roentgenographically before outstanding clinical signs of deficiency appear.

These observations can easily be employed in the differentiation of thyroid deficiency from other states characterized by retardation in growth and development. The administration of thyroid substance should be reflected visibly in the long bones within three to four weeks if a true lack is present; if not, no changes will be observed.

No attempt has been made to extend this standard beyond two years of age, since bone growth is considerably slower thereafter and since other norms for thyroid function are easily applicable to older children.

A curve expressing the growth of the radius in infants without evidence of thyroid deficiency is reproduced.

Brucellar Spondylitis. S. Di Rienzo. *Rev. argent.-norteam. cien. méd.* 1: 737-761, January 1944.

Vertebral involvement, particularly of the lumbar region, is fairly frequent in brucellosis. The lesions occur either in the body of the vertebra or in the soft parts, especially in the intervertebral disk. The peri-vertebral structures may be simultaneously affected or react later in order to consolidate the healing of the lesion. During the initial phase of the process there is an alteration in the shape of the vertebral angles, which may no longer be present in a profile view, and the parallelism between the planes of adjoining bodies is lost. Frequently there are impressions or marks, sometimes deep depressions, in the vertebral bodies. This period is followed by one of definite destruction, with disappearance of the intervertebral disk and fusion of the vertebral bodies. The period of repair begins with an increase in the opacity of the affected region, due to the deposition of calcium salts. The ligaments also become impregnated with calcium and are visible roentgenologically, giving the appearance of "bridges" uniting the vertebrae, "spikes" which approximate the bones, or "lips" which join them. Not all of the above lesions reach the same stage of development at the same time, and while some vertebral lesions are in the destructive period, others may be in the initial or the repair stage. The presence of multiple lesions in different stages of evolution is a characteristic feature of

brucellar spondylitis and must be borne in mind in the differential diagnosis. Appropriate clinical and laboratory studies are necessary to establish the diagnosis. Fifty illustrations accompany this paper.

Massive Extrusions of the Lumbar Intervertebral Discs. A. Ver Bruggen. *Surg., Gynec. & Obst.* 81: 269-277, September 1945.

The author reports 9 cases of acute compression of the cauda equina by a massive lumbar disk extrusion, seen in about 300 consecutive cases of typical herniated nucleus pulposus with sciatica but without bladder symptoms or incapacitating weakness. Eight of the cases were confirmed at operation; the ninth patient died of intercurrent disease before operation could be carried out. This condition represents a serious complication of herniated disks and constitutes a neurosurgical emergency. In spite of early effective treatment, it may lead to permanent disability.

All but one of the patients gave a history of backache for years; 3 gave a history of trauma. Symptoms were characteristically intermittent with a "cog-wheel" progression, *i.e.*, successive acute short episodes. Sciatica had been present in all but 2 cases for years.

The signs were those of compression of the cauda equina, including weakness of the legs below the knees, saddle anesthesia, and sphincter disturbances. Lasègue's sign was positive in 8 patients, and 6 had tenderness over the spinous processes on deep pressure. The deep reflexes at the ankle were affected in all the cases and those at the knee in some. Spinal fluid examination showed a complete block in 3 patients.

The location of the extrusion was at the lumbosacral joint in 3 cases, between the 4th and 5th lumbar vertebrae in 3 cases, and between the 3rd and 4th lumbar vertebrae in 2 cases. Roentgenograms showed narrowing of the affected interspace in 5 cases. Preoperative myelography was not done in any instance.

In discussing the differential diagnosis, the author emphasizes the steady progression of symptoms in metastatic carcinoma of the spine and the short history of two to three weeks in Pott's disease. The history is shorter, also, in patients with cord tumors. Tenderness over the spine and a positive Lasègue's sign are rare in cord tumors. The roentgen examination may be negative in all of the above-mentioned conditions.

Laminectomy was performed in 6 cases and an interlaminar approach was used in 2. The diagnosis was confirmed by histologic examination of the tissue removed. Two patients were able to return to their usual occupations. Six noted improvement in bladder control, strength in the legs, anesthesia, and pain. One patient was still incontinent three and a half years after operation and one still had a paraplegia two and a half years later. None of the patients had pain of any severity at the time of the report.

The reason for the slow recovery is not apparent. In 2 of the cases, myelography was done after operation and showed some deformity at the operative site, but the fluoroscopic findings were considered to be within normal limits. The case in which operation was performed within the shortest interval following the onset of symptoms showed the most incomplete recovery.

With the possibility of such a disabling complication, the author points out, it is not always safe to allow the usual type of herniated disk to remain untreated.

Each case is reported in detail.

FRANK P. BROOKS, M.D.

Congenital Syphilis of Bones and Joints. Arthur Steindler. *Urol. & Cutan. Rev.* 49: 568-575, September 1945.

At times, the clinical diagnosis of congenital syphilis is not easy. In such instances, the roentgenogram may be of invaluable aid in establishing the diagnosis.

A distinction is made between congenital syphilis manifested in the fetus or early infancy and syphilis seen in later infancy. The earlier type is characterized by an osteochondritis and periostitis. There are three phases of osteochondritis: (1) irregularity and broadening of the calcification zone ("barbed-wire" formation); (2) the appearance, in this zone, of yellow or gray soft granulation tissue which extends into the cartilage and may cause a separation of the epiphysis and metaphysis; (3) eventual degenerative changes in the granulation tissue leading to a separation of the epiphysis from the diaphysis. In the late stage of osteochondritis the roentgenograms, especially of the lower end of the femur, tibia, radius, ulna, and phalanges, reveal a transparent zone (granulation tissue) bordered by two narrow layers of calcification. Periostitis is often combined with the osteochondritis and is apparent on the roentgenograms of the long bones as laminated onion-skin layers completely ensheathing the shaft. Diaphyseal osteomyelitis also occurs in early congenital syphilis following the stage of osteochondritis and periostitis, but is rare. It is a gummatous infiltration of the long bones and may be localized or general. The roentgenogram reveals a diffuse rarefaction or a sharp punched-out area. Shafts of the phalanges may show a fusiform swelling.

In late hereditary syphilis, the predilection is for the shafts of the long bones. These show a hyperostotic periostitis and diaphyseal osteomyelitis. In early stages of the diaphyseal osteitis, there may be softening of the bone with a resultant bowing. Skull rarefaction is similar to that found in Schüller-Christian's disease. Gummatous lesions may also be present.

Healing in both early and late congenital syphilis, following specific therapy, is dramatic, with complete disappearance of x-ray findings and resumption of undisturbed growth of bone.

Joint involvement is rare in congenital syphilis. Syphilitic arthritis is either of the gummatous or non-gummatous type. The gummatous type may involve the synovia, with erosion of the cartilage, or may result in a "frozen joint" due to extension of the process from either the diaphysis or epiphysis. Roentgenograms reveal spotty rarefied areas with mushrooming of the articular condyle. The non-gummatous type produces joint effusion and responds promptly to specific treatment.

Syphilitic bursopathy is a painless enlargement of the knee with fluid in the extra-articular bursae. Hydrarthrosis of a joint is often associated with keratitis. Both lesions are resistant to specific therapy. Although Charcot joints are more usual in acquired syphilis, they are occasionally found in congenital syphilis.

MAURICE D. SACHS, M.D.

Radiography in Rib Fractures. Raymond W. Lewis. *New York State J. Med.* 45: 1767, Aug. 15, 1945.

In rib injuries, as in head injuries, unless extensive damage or complications are suspected, it is more sensible to treat the patient for his injury and then, approximately six weeks to three months later, if for medical or other reasons a precise diagnosis is desirable,

examine him roentgenographically. A recent rib fracture without any displacement is usually visible in a roentgenogram only if the rays happen to be directly parallel, or nearly parallel, to the fracture. Consequently, in the customary one to four views, the possibility of detecting a fracture is very slight. X-ray studies after sufficient time has elapsed for reparative changes to have taken place are much more reliable. Early examination causes unnecessary discomfort to the patient and delays institution of treatment.

Case of Osteodystrophy of the Osteoclastic Type Involving the Tarsal Scaphoid. P. Ingelrands, A. Venduvre, and J. Nigoul. *J. de radiol. et d'électrol.* 26: 23-24, January-February 1944-45.

The involved nomenclature employed in the title of this article seems merely to mean, judging from the illustration and from the pathologist's report, a giant-cell tumor. The patient was a girl of 18, and the clinical diagnosis was tarsal tuberculosis. X-ray examination revealed a tumor of the navicular, which appeared to be a typical giant-cell tumor. The case is reported because the tarsal navicular is not a common site of this neoplasm. The bone was removed.

PERCY J. DELANO, M.D.

Calcification of the Two Superior Tendons of the Direct Anterior Muscle. Estève. *J. de radiol. et d'électrol.* 26: 22-23, 1944-45.

An anteroposterior view of the hip joint, illustrating this case report, shows a band of calcific density extending from the region of the anterior inferior iliac spine to the greater trochanter of the femur. It has the appearance of calcification in muscle and tendon and seems to represent the insertion of the gluteus medius or minimus, or possibly a portion of both. The authors report the case as an unusual example of calcification and state that it followed a history of trauma. Pathologically they classify it as generically of the same origin as Pellegrini-Stieda disease, and state that they have searched the literature in vain for a similar example. The case would therefore appear to be of more than ordinary interest; certainly it is an appearance which this abstractor has never encountered in a film.

X-ray therapy was tried, but without result; surgery was being contemplated at the time of publication.

PERCY J. DELANO, M.D.

GYNECOLOGY AND OBSTETRICS

Roentgenologic Localization of the Placenta (Placentography). Raymond J. Scheetz, C. Allen Good, and Arthur B. Hunt. *S. Clin. North America* 25: 993-1004, August 1945.

In painless vaginal bleeding without obvious cause, in the third trimester of pregnancy, roentgen localization of the placenta may be of inestimable aid, substantiating or refuting a clinical diagnosis of placenta praevia. In or beyond the seventh month of gestation, the accuracy of such studies will be 90 per cent or higher, with no attendant risk to mother or fetus. Direct placentography will reveal the site in 85 to 90 per cent of cases, while indirect placentography will give additional evidence in those with inconclusive findings by the direct method. Examination prior to the seventh month is usually unsatisfactory.

In the great majority of cases the placenta will be seen in or near the uterine fundus, either on the anterior or posterior wall; in a few it will be found attached to the lateral walls. The placenta is usually ventral to the fetus. Its shadow is differentiated as a thickening of the uterine wall separated from the fetal shadow by a linear area of decreased density due to fetal subcutaneous adipose tissue. An anteroposterior and two lateral films of the entire abdomen, including the uterine fundus, are needed. One lateral film should be made with soft-tissue technic, the other with spine technic. Movement of the fetus during exposure can be reduced to a minimum, or eliminated entirely, by having the mother breathe deeply several times before the exposure is made. This hyperaerates her blood so that the fetus has a sufficient amount of oxygen.

If one cannot definitely locate the placenta near the fundus, or if the implantation appears to be lower than normal, indirect placentography is indicated. The use of air or contrast media in the urinary bladder after catheterization may be of help in directly visualizing the lower edge of the placenta when its attachment is low, or in indicating indirectly that it is low or central by displacement of the presenting part away from the bladder outline. Certain factors such as interposition of a fetal hand or forearm between the head and the bladder, blood clots in the lower uterine segment, fecal distention of the rectum, disproportion between the fetal head size and that of the inlet, and pelvic tumors may produce upward displacement of the fetal head and make the diagnosis inaccurate. Unless the contour of the bladder outline conforms to that of the fetal head, indicating transmitted pressure, great caution should be exercised in diagnosing placenta praevia.

The authors review their series of 97 patients on whom placental localization by roentgen studies was attempted. Their accuracy was 93 per cent. Their failures, they believe, were largely due to immaturity of the fetus, low implantations with indefinite findings, incomplete examinations, and films of poor quality. They are confident that the examination has merit, that it should be performed more frequently, and that indirect placentography should be used on all cases in which the direct method does not give conclusive evidence.

BERNARD S. KALAYJIAN, M.D.

THE GENITO-URINARY SYSTEM

Case of Roentgenologically Observed Perirenal Edema after Therapy with Sulfanilamide Preparations. Olallo Morales. *Acta radiol.* 26: 334-338, June 30, 1945. (In English.)

Following the administration of a total of 24 gm. of several sulfanilamide preparations for a suspected bronchopneumonia, a 37-year-old woman complained of pains in the left renal region, crystalluria, hematuria, and oliguria.

On the day following cessation of medication, roentgenograms of the abdomen showed the right side to be normal. On the left neither the renal nor the psoas contours could be distinguished. No concretions were observed. There were no visible changes in the lumbar spine; the dome of the diaphragm moved freely on both sides; no fluid exudate could be seen in the left pleura and no atelectasis was present in the left lung base. A normal urogram was recorded on the right side but on the left there was no excretion of contrast medium.

The author considered the above findings to justify a diagnosis of left perirenal edema.

Roentgenography was repeated after intervals of ten and twenty days. Along with subjective improvement in the condition of the patient, the second examination revealed a partially distinguishable left renal shadow and a distinct but diminished excretion of the contrast medium. The left psoas contour was at this time still not demonstrable. Final roentgen examination after twenty days showed normal renal and psoas shadows on the left and uniform excretion of dye bilaterally.

The roentgenological differential diagnosis between perirenal edema and perinephritis is discussed. The usual accessory symptoms of perinephritis, *viz.*, high diaphragmatic dome, pleural exudate, basal pulmonary atelectasis, and lumbar scoliosis are not present in perirenal edema.

Excellent reproductions of roentgenograms accompany the text. VICTOR KREMENS, M.D.

Urinary Schistosomiasis: Report of Two Cases in Maine. Clinton N. Peters, Roderick L. Huntress, and Joseph E. Porter. *J. Urol.* 54: 301-306, September 1945.

This timely article adds two cases of urinary schistosomiasis to the 35 previously reported cases diagnosed in the United States and Canada. The infestation occurs chiefly in the Mediterranean areas, where the snail which acts as the intermediate host is found. The organisms enter the skin, where a local inflammatory reaction is set up, followed by urticaria and eosinophilia. The ova reach the vesical mucosa from the venules and cause marked congestion, followed by necrosis, then fibrosis, and at times the deposition of calcium salts in the submucosa. Malignant change may occur.

The presenting symptom is usually terminal hematuria. Diagnosis is based on biopsy or demonstration of the organisms in the urine. Suspicion of infestation from the case history, symptoms, and blood picture is grounds for specific therapy, which consists in parenteral administration of an antimony compound, Foudrin.

X-ray signs that are rather characteristic, when present, are (1) dilatation and tortuosity of the pelvic ureters with a normal pyelographic picture above; (2) demonstration of calcification in the bladder wall.

The two cases reported occurred in brothers who had lived in Palestine. In one the organisms were demonstrated; in the other a clinical diagnosis was made. Both responded dramatically to treatment.

JOHN A. COCKE, M.D.

Asymptomatic Pyuria in Young Men. Francis A. Beneventi. *Am. J. Surg.* 69: 224-226, August 1945.

Fifteen of 80 men who had complete urological studies at a naval mobile hospital in the tropics had no symptoms but were examined solely because of the presence of leukocytes in occasional specimens of urine. With one exception, the men were under twenty-six years of age, and all were considered to be in good physical condition. In 5 men a serious upper urinary tract condition was found—in 3, an anomaly of the kidney; in 1, a bilateral nephrosis; and in 1, a large stone of the kidney pelvis with consequent hydronephrosis on that side. Two of the remaining 10 men had inflammatory ureteral strictures, while 2 had chronic prostatitis; in 6 instances

no disorder of the urinary tract could be found. This small series of cases emphasizes the importance of urologic investigation of any young man with leukocytes, either persistently or sporadically, in his urine.

Chyluria: Clinical, Laboratory and Statistical Study of 45 Personal Cases Observed in Hawaii. Shoyei Yamauchi. *J. Urol.* 54: 318-347, September 1945.

Chyluria is a clinical entity characterized by the presence of chyle in the urine, usually in association with microscopic or gross blood. It is seen most frequently in areas where filariasis is endemic, and the latter condition is usually regarded as the foremost predisposing cause, though, as in the author's cases, filariae may no longer be demonstrable in the blood or urine.

Chyle enters the urinary stream through a fistulous opening between the renal lymphatics and the caliceal fornix. This abnormal communication is due to a rupture of the fornix occurring as the result of increased intrapyelocaliceal tension, immediately attributable to urinary stasis. Urinary stasis is believed to act in two ways: in the first place, it leads to rupture of the fornix; in the second, it permits the entrance of urine into the perirenal tissues, veins, and particularly the lymph channels. Inflammatory stasis develops in the lymph nodes, which in turn aggravates the lymphatic varix characteristic of filarial disease. Thus a vicious circle is established, particularly if the cause of the urinary stasis is persistent or progressive.

In the author's series of 45 cases, the interval between the last exposure to filariae and the onset of chyluria ranged from a few months to forty-five years. The cases were divided about equally between the sexes. The course is described as "unpredictable." It may begin unexpectedly and last a few days, weeks, months, or even years, with periods of exacerbation or remissions of varying duration, or it may cease completely for varying periods and recur at regular or irregular intervals. The attacks may stop as suddenly as they began, in a matter of hours or days.

Symptoms include backache, urinary frequency, dysuria, a dusky pallor due to anemia from blood loss, and a peculiar wizened appearance as a result of loss of subcutaneous fat. The outstanding feature is the voiding of a milky urine, unilaterally or bilaterally, or first on one side and then on the other.

Pyelographic studies were done in 32 of the author's cases, revealing pyelovenous reflux in 3 cases, pyelolymphatic reflux in 6, pyelovenous and pyelolymphatic reflux in 13, and pyelotubular reflux in 2. In 8 instances no shadow was obtained. The author believes it safe to conclude that the reflux shadow, particularly of the pyelolymphatic type, is the characteristic pyelographic feature of chyluria.

Control of chyluria can be accomplished with little difficulty by repeated intrapelvic lavage with silver nitrate solutions, but the cause of urinary stasis must be removed, and the intake of fat must be limited following lavage. ALTON S. HANSEN, M.D.

Roentgenologic Differentiation Between Hypertrophy of the Prostate and Vesical Uroliths. Axel Renander. *Acta radiol.* 26: 329-333, June 30, 1945. (In English.)

Renander presents 2 cases in which a hypertrophic lobe of the prostate bulging into the bladder was interpreted roentgenologically as a non-opaque vesical

urolith. In each case operation revealed the formation in question to be an enlarged tertian lobe of the prostate. The original diagnosis of organic vesical urolith had been made following urography and air cystography, which in each instance revealed a homogeneous shadow the entire circumference of which was clearly outlined with no suggestion of a stalk. The point is made that the problem is purely a matter of roentgen ray projection, the invading prostate as visualized on the film obscuring the prostatic stalk and thus giving the impression of a free formation in the bladder.

Palugyay's claim that a hypertrophic lobe of the prostate does not change its position in the bladder with change in the patient's position is emphasized as a differential diagnostic feature, but the author cautions against misinterpreting apparent changes in position.

VICTOR KREMENS, M.D.

THE BLOOD VESSELS

Retrograde Arteriography in the Study of the Abdominal Aorta and Iliac Arteries. P. L. Fariñas. *Surgery* 18: 244-249, August 1945.

In 1941 the author described a procedure for aortography with the aid of a urethral catheter (*Am. J. Roentgenol.* 46: 641, 1941. *Abst. in Radiology* 39: 121, 1942). In view of the difficulty, during the war, of obtaining rubber catheters, he has substituted a procedure which he designates as "retrograde abdominal aortography." In this method the femoral artery is exposed by blunt dissection, under local anesthesia, at the level of Scarpa's triangle and punctured with a trocar 1.5 mm. in diameter. Through this trocar are injected 50 c.c. of a 70 per cent solution of diodrast in two and one-half to three seconds. Tourniquets must be placed at the roots of both lower extremities in order to avoid the passage of the contrast medium into the arteries of the legs. The Trendelenburg position may be required in certain cases. The opaque medium reaches a higher level during diastole and descends during systole, entering then into the branches of the abdominal aorta.

To avoid changes in pressure when the opaque substance is injected by hand, the author has designed an apparatus to maintain a constant pressure and rate of injection. It consists of a pump with a piston worked by an air compressor with a regulator and manometer. With a constant pressure of fifteen pounds, it is possible to inject 25 c.c. of the opaque substance per second. The first exposure is made when 40 c.c. of the opaque substance have been injected and the second immediately afterward. A stitch is placed in the adventitia of the artery after the trocar is withdrawn.

Pathologic changes in the abdominal aorta and iliac arteries can be studied by this method; changes in contour, strictures, and dilatations are demonstrable. Aneurysms can be accurately localized and the degree of permeability of the aneurysmal sac, the presence of canalization and the degree of collateral circulation established. The author has had no accidents with the method.

J. E. WHITELEATHER, M.D.

Treatment of Pulmonary Embolism. Lewis S. Pilcher. *Am. J. Surg.* 69: 190-203, August 1945.

A review of the etiology and present treatment of pulmonary embolism emphasizes the fact that most emboli originate from free propagating thrombi in the

femoral venous system. The author discusses the use of femoral vein ligation in the prophylactic treatment of pulmonary embolism and evaluates the use of venography in the diagnosis and localization of femoral thrombi. With his method of venography, the dye is injected into the superficial vein at the internal malleolus or into one of the other superficial veins of the foot, with the ordinary intravenous needle (size 19). Usually it is not necessary to cut down on the vein. A blood-pressure cuff is placed around the upper, not the lower leg, as high up in the groin as possible, and inflated to 20 mm. of mercury at the time of the injection. Thus the dye is held in both the superficial and deep veins during the x-ray exposure, giving a comparative silhouette of the two systems simultaneously. This comparative picture contributes additional diagnostic information.

In the normal venogram produced by this method of injection, three main venous trunks should be visible in the upper leg—the saphenous medially and the double shadow of femora and profunda centrally. The absence of one of these shadows is of great significance diagnostically. Similarly, in the lower leg, the three main systems of internal saphenous, anterior and posterior tibial should normally be present. It is important to have films of both legs with identical amounts of dye and identical technic, for in some instances with partial obstruction the vein shadow will not be absent but merely narrowed. Such narrowing can be definitely determined only by comparison with the venogram of the opposite (normal) leg.

Because of the possibility of iodide poisoning, every patient should be tested for iodide sensitivity by having him hold a few drops of the solution on the tongue before the intravenous injection.

Five cases are reported in which accurate diagnosis of femoral vein thrombi was made largely through the use of venography, and in which satisfactory results were obtained by ligating and partially resecting the involved femoral vein. In 3 cases, the pulmonary embolism occurred before the femoral vein ligation was performed. The ligation and partial resection of the femoral vein, in addition to removing the danger of further pulmonary emboli, was found to have a beneficial effect on any associated thrombophlebitis.

THE SPINAL CORD

Devic's Disease. A Clinical Review and Case Report. S. J. Silbermann. *J. Nerv. & Ment. Dis.* 102: 107-120, August 1945.

Devic's disease, or neuromyelitis optica, is a morbid process involving two anatomically and physiologically independent neural structures, the spinal cord and the optic pathway. Clinically, a rather acute or subacute onset with a relatively short interval between the development of myelitic and visual deficiencies, with a progressive or regressive course, is fairly typical. Death occurs in 50 per cent of the cases, due either to ascending myelitis or to secondary complications. If the patient survives, residual damage remains. Complete restoration of health has rarely been reported.

Until recently, almost all authors agreed upon an infectious toxic agent as the most probable cause of this disease; it is now believed that it may be the result of an anaphylactic reaction of the central nervous system. In the light of histopathologic and etiologic studies of

the so-called demyelinating diseases, modern investigators view Devic's disease, multiple sclerosis, diffuse sclerosis, and the encephalomyelitis as basically identical processes, the difference being the location, intensity, and other individual variabilities.

One of the unusual features of the author's case, in a colored woman of eighteen years, was the presence of a spinal block, with a roentgen picture that was fairly conclusive of an associated diffuse adhesive spinal arachnoiditis. It is quite possible that similar changes were present in the cranium. However, neither objective nor subjective evidence for such an assumption was available.

FOREIGN BODIES

Nomographic Calculation of X-Ray Localization Values. Solve Stenström. *Acta radiol.* 26: 339-344, June 30, 1945. (In German.)

Numerous errors may ensue if, in the x-ray localization of foreign bodies, the factor of magnification at the various depths of the object is neglected. The author describes a nomographic procedure which considers the different degrees of magnification and which permits rapid calculations in application of Larsson's method of localization (*Acta radiol.* 22: 704, 1941).

ERNST A. SCHMIDT, M.D.

RADIOTHERAPY

NEOPLASMS

Treatment of Advanced and Inoperable Cancer: A Résumé of Current Trends Based on a Review of the Literature and Analysis of Personal Case Experiences. Wm. E. Howes and Alfred L. Shapiro. *Surgery* 18: 207-228, August 1945.

This paper is concerned primarily with the care of the patient with advanced cancer, inoperable at least in the sense that definite possibility of cure cannot be assured. It can be estimated that 80 per cent of all cancer patients, excluding those with small epitheliomas, will either primarily or secondarily require palliative care. The authors give a working classification of advanced cancer cases, present in outline form the more common conditions calling for palliation, and discuss methods of treatment. These include irradiation, surgery, pharmacologic therapy, physiotherapy, and psychotherapy.

Limitation of growth, diminution in size, control of secondary infection, and, on occasion, total ablation of the primary lesion or of individual metastases are the major objectives of roentgen therapy. In such tumors as the lymphoblastomas, Ewing's myeloma, and epitheliomas of the skin, pharynx, and cervix, radiosensitivity or accessibility of the lesion often contributes to a dramatic result. Local and lymphatic recurrences of breast cancer frequently respond to intensive irradiation. The interstitial use of radium or radon in squamous-cell carcinoma, cancer of the rectum and bladder, and metastases from cancer of the breast may lead to arrest or destruction of the lesion. Radiation has also proved of palliative effect in laryngeal, esophageal, bronchiogenic, and gastric cancer, in advanced secondary cervical lymphadenopathy, and the "frozen pelvis."

Bone metastases, particularly those secondary to mammary carcinoma and cancer of the testis and thyroid, often respond favorably to irradiation. Lymphoblastomatous, leukemic, and myelomatous infiltration of bone is also frequently benefited, particularly in the initial course of therapy. Bone metastases of other origin respond less satisfactorily or not at all. Isolated pulmonary, pleural, and mediastinal metastases of the more radiosensitive tumor types have been known to recede with radiotherapy. Ascites due to peritoneal implantation by ovarian carcinoma may respond favorably, permitting prolongation of the period between tappings.

The various surgical measures for palliation are discussed in some detail, special mention being made of

control of pain by interruption of the pathways of the nerve impulses. Formidable surgical procedures in patients with incurable malignant growths have the sole object of mitigating or forestalling unbearable agony where the sufferer can, in the event of survival, look forward to a period of months or years free from pain. An operative death rate as high as 10 per cent is not as deterrent as in elective general surgery, since, where extreme suffering cannot be palliated, a surgical mortality cannot be construed as equally unwelcome.

Pharmacologic therapy includes the judicious use of analgesics; supportive measures, such as high-calorie diets and vitamin preparations; endocrine therapy as indicated, and local application of the sulfonamides, penicillin, and other ointments to infected, ulcerating, and fungating lesions.

Physiotherapy has little to offer in this field, though occasional employment of such measures as diathermy and moist heat may afford relief. Psychotherapeutically the attitude of the physician and thorough and sympathetic nursing care are of paramount importance.

The authors present a series of 42 selected cases of advanced and recurrent cancer referred to the Brooklyn Cancer Institute as "beyond attempts at cure." With three exceptions, all patients received secondary radiation, radium or radon therapy, usually in several cycles. The techniques used varied considerably, in view of the variety of neoplasms treated, but total amounts comprised adequate accepted tumor lethal doses in all instances. Primary resections were carried out in half the cases, most often by electrotherm cutting current, for symptomatic relief by excision of extensive infected, ulcerative, or fungating lesions. In most of the others, radical secondary resection with hope of tumor extirpation was carried out. In several instances radiation alone sufficed. All the patients were ambulatory, active, and in relative comfort at the time of the report. Survival periods ranged from two and a half to fourteen years, averaging four and a half years. In 24 patients presumptive cures and in 9 instances definite arrest were attained; the remainder were notably improved.

J. E. WHITELEATHER, M.D.

Radium Therapy of Hemangioma. Lester M. J. Freedman, Harold W. Jacox, and Lawrence G. Behnhauer. *Urol. & Cutan. Rev.* 49: 560-567, September 1945.

The authors describe their method of contact radium therapy of hemangioma and report their results in a

series of 95 patients. Platinum needles, 19.0 mm. in length, 1.7 mm. in outside diameter, with a wall thickness of 0.5 mm., each containing 10.0 mg. of radium element, were used. These were variously arranged, not over 1.0 cm. apart; application was usually for one hour, though in thicker lesions this was extended to an hour and a half or two hours. A second treatment was given after an interval of six to eight weeks, a third in not less than four months, and a fourth in not less than six months. Rarely five or six treatments were required.

Seventy-nine of the series of 95 patients were one year of age or less. One patient died at the age of three weeks with hemangiomatosis of the lungs and abdominal organs, and 3 failed to return after the first treatment. Excepting these, 107 lesions were treated, with a perfect result in 65 and definite improvement in 35. The best results were obtained in the "strawberry mark" or vascular nevi. Of the 7 failures, 6 were in nevi of the "flame" type (port-wine marks), but even in this group encouraging results were obtained.

MAURICE D. SACHS, M.D.

Radio-Sensitive Parasellar Tumors: Report of a Case. Walter S. Lawrence and Walter W. Robinson. *South. M. J.* 38: 510-513, August 1945.

The authors preface their case report with a general discussion of pituitary and parasellar tumors. Their patient was a man of 25 seen by them in January 1944, with a history of polyuria and severe headaches. Loss of vision had begun the preceding September, when examination showed bilateral optic atrophy and contraction of both visual fields. On examination two months later a diagnosis of a chiasmal lesion with diabetes insipidus was considered and exploratory transfrontal craniotomy was recommended but refused. Hormone therapy was ineffective, and loss of vision progressed to complete blindness. By December 1943, operation was considered useless, and x-ray therapy was suggested. This was begun early in January. After the fourth treatment vision had returned sufficiently so that the patient could control his movements about the house and his polyuria was markedly diminished. After the seventh treatment he made trips to a distant city alone. A month after the completion of his treatments, the sight of his left eye was 20/200 but only light perception was recovered in his right eye. His sexual powers, which had been impaired, were also improved.

Treatment was by the multiple port method at weekly intervals, approximately 300 r per treatment. The factors were: 185 kv., 0.5 mm. Cu and 1.0 mm. Al filtration, 40 cm. distance, and all radiation was given through a 5-cm. cone. At the end of the fourth month the interval between treatments was increased to one month. The total dose in eight and a half months of treatment was 5,535 r.

The radiosensitivity of this growth suggests a true pituitary origin. The symptoms were rather characteristic of a chromophobe pituitary tumor, yet there was no roentgenographic evidence of expansion or erosion of the sella and no suprasellar calcification. The suggestion is made that this growth, although originating within the pituitary fossa, may have developed ectopically.

The authors point out that patients with symptoms of pituitary tumor should receive high-voltage therapy

before the advent of ominous visual disturbances even in the absence of positive roentgen findings.

MAX MASS, M.D.

Carcinoma of the Esophagus. A Survey of 332 Cases. Edwin Boros. *Gastroenterology* 5: 106-111, August 1945.

An analysis is made of the results of various forms of treatment in 332 cases of esophageal cancer seen at the New York City Cancer Hospital from 1922 to 1944. Eighty patients received intensive radiation therapy. They generally stood the treatment well. In only an occasional instance was there any elevation of temperature. There was sometimes improvement in deglutition but not sufficient to warrant the inference that it could be expected with any measure of certainty. A few patients gained weight, but for the most part the weight remained stationary or declined. Esophagoscopy revealed no evidence of shrinking of the tumor following irradiation, or any sign of abatement of the process. Congestion and edema in a pronounced form constituted the general picture. The length of life ranged from one to eleven months following irradiation. No details as to the method of treatment are given.

Seven patients were operated upon with a view to total extirpation of the tumor and the lesion was found to be inoperable. Gastrostomy was performed on 168 patients and, while relief in swallowing was experienced by some, no prolongation of life resulted. The operative mortality was high, 25 per cent. Twenty-five of the 80 patients receiving radiation therapy also had a gastrostomy, but the results appeared the same as in patients having a gastrostomy only.

The author concludes that, in spite of everything so far devised, cancer of the esophagus is practically always fatal; the results of surgery have been almost uniformly bad.

Clinical Results with Rotation Therapy in Cancer of the Esophagus: Preliminary Report Based on 174 Cases. Jens Nielsen. *Acta radiol.* 26: 361-391, June 30, 1945. (In English.)

In addition to a discussion of his experimental studies in rotation therapy of esophageal cancer, Nielsen presents his observations and results with this form of therapy in 174 cases treated at The Radium Center in Copenhagen. The theoretical basis of rotation therapy is discussed at length by the author and his associates in previous publications (see, for example, *Acta radiol.* 25: 95, 1944. *Abst. in Radiology* 46: 546, 1946).

Treatment is carried out under constant fluoroscopic control. "With fields so narrow that the volume dose, despite a very considerable tumor dose, is kept within moderate limits, it is only by screening that we can make absolutely sure that the beam is really centered on the esophagus during the whole of the rotation." The patient is seated on a stool which rotates about a vertical axis while the roentgen tube is in a fixed position with the central ray directed horizontally. The rotation time is usually ten to fifteen minutes. The patient is instructed through a speaking grill to lift his arms and place them over his head when it is observed by the operator that they come within the roentgen ray beam. If the lesion is situated so high that the shoulders come into the beam during the rotation, it is best to interrupt the irradiation during their passage. Allowances for deviation of the esophagus in relation to

the axis of the thorax during the rotation are made by arranging the diaphragm in such a manner that it can be displaced a few centimeters to each side by means of a Bowden cable manipulated from the control booth. A mouthful of barium paste is swallowed by degrees from time to time during the rotation, serving to mark the point of stenosis.

The curative tumor dose is about 5,000 r delivered over a period of five to eight weeks. One hundred and eighteen cases were treated with radiation of half-layer value of 0.3 mm. Cu (180 kv., 6 ma., 2-3 mm. Al) and 56 with radiation of half-layer value of 0.9 mm. Cu (180-200 kv., 15-30 ma., 0.5 mm. Cu). The focus-axis distance in all cases was 50 cm. The width of the axial field varied from 3 to 6 cm. The most suitable daily dose was found to be a tumor dose of between 100 and 200 r given in two sittings.

The cutaneous reaction is at the most a moderate dry epidermitis. General reactions were slight. Cicatricial stenoses or perforations following therapy created no particular problem.

No attempt is made to evaluate ultimate results of this form of treatment. In 20 per cent of the cases, treatment could be considered only as palliative, since a tumor dose of less than 3,000 r was given. Improvement of deglutition was marked in many cases. Freedom from symptoms or definite improvement was obtained in 117 cases. Twenty-five per cent of the patients were alive after one year, and 15 per cent after two years, as compared to 10 and 4 per cent, respectively, in earlier series not receiving rotation therapy.

The author believes that treatment of cancer of the esophagus will in the future be chiefly by radiation and preferably by the rotary technic. Results will be still further improved by the use of more penetrating radiation (million-volt roentgen rays).

Several photographs of the equipment used are reproduced.

VICTOR KREMENS, M.D.

Carcinoma of the Breast: Study of 37 Cases. George B. Kent and Kenneth C. Sawyer. Rocky Mountain M. J. 42: 672-676, September 1945.

The authors begin with the statement that progress in the treatment of cancer of the breast has not been comparable to that in the treatment of other neoplasms. The rich bed of lymphatics in which the breast lies, the anaplastic nature of most of the growths, and the accessibility of the region to trauma contribute to this unhappy situation.

Of the present series of 37 patients, 40.5 per cent were between the ages of forty-five and fifty-four and 32.4 per cent were between fifty-five and sixty-four. The youngest patient was twenty-four and the eldest seventy-five. Involvement of the left breast was more frequent. There was demonstrable lymph node involvement in 40 per cent of the cases.

It is the authors' practice to remove the entire breast for frozen section diagnosis, however innocent the clinical appearance may be. Of this series, 70.2 per cent were of the scirrhous type, 21.6 per cent were adenocarcinoma, 4.1 per cent medullary carcinoma. There was a single case of Paget's disease. Ninety per cent of the tumors were of grades 3 and 4 (Broders).

The authors admit that their experience with preoperative roentgen therapy does not qualify them to offer an opinion as to its value. They have not favored it, however, because of the generally recognized

danger of infection and necrosis following subsequent surgery and also because of the delay in operation which is involved. Two cases in their series, however, which received preoperative irradiation elsewhere did well following operation. The authors question, also, the advisability of postoperative irradiation and cite Harrington's statement comparing the results with and without such treatment. He found that only 4.8 per cent more patients with lymphatic involvement who had received postoperative irradiation were living at the end of five years, whose lesions had been graded 3 or 4, while 4.2 fewer were living after ten years whose lesions were graded 1, 2, 3, and 4. [The italics are the abstractor's.] The authors' operative mortality was 4 per cent. The three-year survival rate was 75 per cent, the five-year rate 50 per cent, and the ten-year rate 15 per cent. In the group with axillary metastases the corresponding figures were 66 per cent, 25 per cent, and 7.5 per cent.

PERCY J. DELANO, M.D.

Lymphosarcoma of the Mediastinum in a Child—Results with Radiation Therapy. Nine Year Follow-Up Study. Benjamin Kaufman. Arch. Pediat. 62: 340-353, August 1945.

This article presents in full detail the case history of a child who had been under observation since infancy. A mediastinal enlargement was discovered early, and at the age of three years and three months a diagnosis of lymphosarcoma of the mediastinum was made by needle biopsy. Radiation therapy was then begun, 3,000 r (in air) being delivered to each of two chest ports, with subsequent reduction in the size of the tumor. Later, following the occurrence of diarrhea, radiation in moderate dosage was given over the back and abdomen. Subsequently lesions, presumably metastatic, were demonstrated roentgenologically in the right hip, skull, and radius. These lesions were also irradiated; dosage, however, was limited because of the parents' fear of the effects on epiphyseal growth.

Death occurred after a nine-year course. In summary the author comments: "Looking back over this long and painful history I am impressed that the recurrent lymphosarcoma metastases proved to be very much more radio-resistant than the original lesions and that they could have been halted probably only by much more intensive depth doses. . ."

PERCY J. DELANO, M.D.

Results of Various Types of Treatment in Adenocarcinoma of the Endometrium. Charles E. McLennan. Am. J. Obst. & Gynec. 50: 254-262, September 1945.

The author discusses the results of treatment of 225 women with uterine corpus carcinoma by x-ray, radium, and surgical methods. Of 111 who were treated over five years ago, 45 per cent were living, free of disease.

Thirty-one of the five-year series of 111 had been treated primarily elsewhere, while 80 were treated solely in the author's clinic. Of the latter group, 46 received radiation therapy alone; in 5 others treatment was originally limited to irradiation but hysterectomy was ultimately done for recurrence. Twenty-nine patients were treated by total hysterectomy, and of these 83 per cent lived more than five years free of disease, whereas only 22 per cent of those treated radioactively survived five years. The latter group

contained all the inoperable and "bad risk" cases, but the author feels that more might have been salvaged by liberalizing somewhat the criteria of operability. Of those treated elsewhere, many were admitted with vaginal metastases; following irradiation, 42 per cent of these lived for at least five years.

The "routine" or standard method of treatment for this disease up to July 1941 consisted of deep x-ray therapy—two and a half to three erythema doses at the tumor site delivered in 25 to 30 daily treatments, over approximately four weeks, followed by 5,000 mg. hr. of radium therapy within 100 hours, with total hysterectomy and bilateral salpingo-oophorectomy four to six weeks later. Only 53 per cent of the patients received the "routine" treatment, though 71 per cent had "complete" treatment in the sense that total removal of the uterus was accomplished. Many of the patients could not complete the "routine" treatment because of complications which arose, and others were not subjected to it because of contraindications listed in detail in the original article.

Of 114 patients followed less than five years, 66 received "complete" treatment, with 84.8 per cent surviving; 49 were given "routine" treatment (radium and surgery), with 93.8 per cent surviving, and 27 were given incomplete or no treatment, with 25.9 per cent surviving. The ultimate survival rate of the last group is expected to be very low.

The operative mortality for all patients was 5.8 per cent. When 3 patients with virtually hopeless prognosis are left out, however, that mortality drops to 3 per cent. The postoperative deaths, which are considered in detail, were due to complications in almost every instance.

Poor results are to be expected from treatment by radiation alone. Some patients may be salvaged by later hysterectomy for recurrent or persistent carcinoma. The results of giving full-tolerance doses of x-radiation have been so poor in this author's experience that the practice has been eliminated as a part of the "routine" treatment of many patients and greater dependence has been placed on radium and total hysterectomy, with distinct reduction in morbidity and mortality, although it is too early to draw conclusions as to end-results. Final results will depend to a considerable extent on the nature of the material presented for therapy, medical and surgical complications, age, weight, and nutritional status.

BERNARD S. KALAYJIAN, M.D.

Carcinoma of the Cervix Complicated by Pregnancy. J. Robert Willson. *Am. J. Obst. & Gynec.* 50: 275-283, September 1945.

While carcinoma of the cervix is rare during pregnancy (0.015 per cent in the author's series), it should be considered in the differential diagnosis of painless uterine bleeding. During the first trimester of pregnancy, bleeding usually indicates threatened abortion. If it does not cease after one week of bed rest, sterile vaginal examination, including visualization of the cervix, is imperative. The diagnosis of pregnancy can thus be confirmed and the bleeding site determined. Cervicitis or areas of decidual reaction on the cervix during pregnancy may be everted, friable, and bleed easily on manipulation. Such areas cannot be differentiated grossly from carcinoma. Microscopic examination of a biopsy specimen should therefore be done by a pathologist thoroughly familiar with the

normal morphological variations in the pregnant cervix, which also must be differentiated from malignant change. If the microscopic diagnosis is questionable, treatment should be withheld until the sections have been reviewed by several competent gynecologic pathologists and, if necessary, new biopsy specimens have been obtained.

The prognosis for carcinoma of the cervix found during pregnancy is apparently as good as in the non-pregnant woman. The belief that the rate of local growth of the tumor is accelerated by pregnancy has not been substantiated, nor is there evidence that pregnancy increases the opportunity of spread of the disease into the surrounding tissues. There is, indeed, some evidence to the contrary, cited by the author. Naturally, far advanced carcinomas have a poor prognosis, but in those discovered early by the alert physician the outlook is good.

X-ray therapy should be started immediately after establishing the diagnosis in the first trimester of pregnancy. Abortion will usually occur during the third week of irradiation. Should it not occur or be incomplete, curettage should be carried out. The aim is to deliver 3,000 r to each parametrium, with radium insertion after the uterus has been emptied. The radium dosage is at least 5,000 mg. hr.—one-third to the uterus and two-thirds to the cervix.

During the early part of the second trimester, treatment is as described above, though the radiation is less effective because of the size of the uterus. Later in the second trimester, surface application of radium to the cervix, followed by abdominal section, x-irradiation, and intrauterine radium therapy, is indicated. Unless the lesion is very small, delivery from below is contraindicated at that time, because of danger of hemorrhage.

During the third trimester, the last method applies and often the baby can be saved without undue risk to the mother.

The author describes 6 cases of cervical carcinoma during pregnancy, 4 of which were discovered in the clinic with which he is associated. One patient refused treatment. Two of the remaining three have survived over five years.

BERNARD S. KALAYJIAN, M.D.

On the Treatment of Malignant Tumors of the Testis. Haakon Ødegaard. *Acta radiol.* 26: 345-352, June 30, 1945. (In English.)

Malignant testicular tumors, from a practical clinical standpoint, are classified into two main groups by the author: (1) seminomas and (2) malignant embryonal testicular tumors, "teratomas." The genuine sarcoma and the true carcinoma are so rare that they are considered to be of little significance.

Norwegian and American sources show testicular tumors to constitute 0.3 per cent and 0.5 per cent, respectively, of all malignant neoplasms in men. These tumors occur with equal frequency on both sides, and 81.8 per cent of the patients fall within the twenty- to fifty-year age group. In about 10 per cent of cases the affected testis is ectopic.

Lymph node metastases have proved to be the confounding element in treatment and prognosis. According to Grevillius (*Acta chir. Scandinav.*, Supp. 48, 1937), metastases from seminomas and teratomas occur within a year in 62.5 and 92.6 per cent of cases, respectively. Higgins and Buchert (*Am. J. Surg.* 43: 675, 1939) report supraclavicular lymph node

metastases in 15 per cent, lung metastases in 13.8 per cent, mediastinal metastases in 3.0 per cent, and spread to the inguinal lymph nodes in 4.8 per cent of cases.

The usual treatment today is orchiectomy with post-operative irradiation. It seems, however, from various reports, that with teratomas roentgen treatment does not prolong life, but with seminomas the survival period is increased.

At the Norwegian Radium Hospital, roentgen treatment is given to one iliac field, one field toward the lumbar region from the front, and one larger field toward the lumbar region from the rear (illustrative diagrams are given). One field is treated per day, six days in the week. The daily dose is about 350 r with 175 kv., 4 ma., 50 cm. distance, 0.85 mm. Cu plus 0.5 mm. Al filtration. The total dosage is about 3,500 r to each field.

Twenty-one seminomas and 16 teratomas have been treated at the Norwegian Radium Hospital in the period 1935-41; 19 and 13 cases received adequate post-operative irradiation. Of the patients with seminoma, 11 survived, free from recurrence, two years or more, 8 of these three years or more, and 2 more than five years. Of those with teratoma, 4 survived for over two years, 3 of these for more than three years.

VICTOR KREMENS, M.D.

Teratoma of the Testis: Report of Sixty-Five Cases. John L. Barner. *Am. J. Roentgenol.* 54: 257-261, September 1945.

Sixty-five cases of teratoma of the testis were observed at an Army general hospital, representing 7.86 per cent of all cases of malignant tumors. The necessity for an early diagnosis in testicular tumors cannot be overstressed. The most frequent symptom is painless swelling. In 6 cases the tumor was found on routine examination for other purposes. There is a tendency for the organ to retain its natural outline. It is usually smooth and freely movable. The mass does not transilluminate. In those cases which offer any question of diagnosis, it is believed a surgical exploration is warranted.

The treatment consists in combined surgery and irradiation. Adequate operation involves orchiectomy and removal of the cord with accompanying structures high at the internal abdominal ring. As early as the third to fifth day after operation, a course of external deep roentgen therapy is begun. In cases without metastases, the portals of treatment are over the operative site, the mid-abdomen, epigastrium, and posteriorly over the upper sacrum and abdomen, and flanks. When metastases are present or suspected, the fields are the same with the addition of a lateral abdominal field, anterior and posterior chest fields, and usually a field over the left supraclavicular region.

Follow-up shows that 10.7 per cent of the patients in this series have died.

CLARENCE E. WEAVER, M.D.

Radium Therapy in Carcinoma of the Penis. Wickham and Dauvilliers. *J. de radiol. et d'électrol.* 26: 6-9, 1944-45.

The authors review the results of others in the treatment of carcinoma of the penis and report their own experience with 45 cases. Of this group 26 were considered to be beyond hope of cure, either because of extension or recurrence. Of the remaining 19 patients,

14 were treated by radium and of these 8 were well after periods of one to eight years. Radium puncture and surface application were used either separately or in combination.

The usual form of surface applicator was a moulage, individually designed in each case, with a tube-skin distance of from 1 to 5 cm. The dose varied from 1,300 to 20,500 r, calculated at the center of the penis. In one case, 13,000 r were given to the surface and 20,000 r deeply by puncture; following this, recovery ensued with restoration of a normal appearing organ.

The authors have apparently found that in the majority of cases the associated adenopathy is inflammatory. Radiotherapy of enlarged nodes is not advocated. If they do not disappear following treatment of the primary lesion, they may eventually be excised.

PERCY J. DELANO, M.D.

Supplementary Measures in Radium Therapy of Epitheliomas of the Penis and Evaluation of the Dose in Roentgens. Lucien Dauvilliers and Marcel Frilley. *J. radiol. et d'électrol.* 26: 3-4, 1944-45.

The authors begin by commenting upon the difficulties of measuring gamma radiation in r units, due in some measure to variation in intensity with changes in the distance factor.

The first portion of the article will be of particular interest to physicists, as it concerns ways and means of arriving at an accurate estimate of the dosage received by the tissues irradiated. One example is cited, which is easily remembered and tends to remind one of the great variation in dosage with alteration of distance, i.e., the fact that between a distance of 20 mm. and one of 22 mm., there is a 20 per cent variation in the amount of radiation received by the skin. The authors do not consider so much what is their probable maximum dose at the point of greatest intensity but rather concern themselves with the smallest dose received at the periphery of the lesion.

In cancer of the penis, the difficulties are not so great, because of the limited field. The authors consider that they achieve something like homogeneous irradiation in the involved areas.

PERCY J. DELANO, M.D.

Plasmocytoma of Temporal Bone. J. C. Gros. *Arch. Otolaryng.* 42: 188-190, September 1945.

An exploratory mastoidectomy in a patient with a slowly progressive Gradenigo syndrome of four years' duration, with tinnitus and deafness, trigeminal pain, and paralysis of the fifth and sixth cranial nerves, revealed a plasmocytoma of the temporal bone, involving the middle ear, the mastoid, and the petrous apex.

Following the operation, the patient received high-voltage roentgen therapy. Over a three weeks' period (March 1-24) she was given 5,700 r at 30 r per minute to a field 8 × 9 cm. The area treated covered the entire petrous bone, the ear, and the mastoid. Treatment was discontinued for about five weeks because of the pronounced reactions in the auricular cartilage. All ocular pain had disappeared, but paralysis of the external rectus muscle persisted. The second course of treatment consisted of 4,000 r at 18 r per minute, over a seventeen-day period (May 3-20), to a somewhat more anterior field, so that the petrous bone itself could be irradiated. The external ear was carefully protected. At the end of the second course of treatment there was evidence of movement of the left eye. This

movement improved to the extent that there was only a slight strabismus in the extreme left position.

X-Ray Treatment of Warts. Everett E. Seedorf. *Urol. & Cutan. Rev.* 49: 494-496, August 1945.

The prime purpose in all forms of therapy for warts is their complete destruction. It is the consensus among dermatologists that surgery should be used only as a last resort. Irradiation in the hands of an experienced physician has many advantages over other forms of therapy. It is painless; reactions are mild; there are no secondary infections, and cosmetic results are better. Whether radium or x-ray is used, it is agreed that a single massive dose is preferable to fractional irradiation. Radium is not as adaptable to use as x-ray. Coalescent warts should be destroyed, a portion at a time, by electrodesiccation.

The surface of a plantar wart should be peeled before treatment by radiation. The average dose for such warts is 1,200 r (80 to 120 kv.p. with practically no filtration). With smaller lesions, comparably larger doses are required, but even for the smallest ones 1,800 to 2,000 r is usually enough. If the diameter exceeds 1 cm., the dosage should be reduced proportionately.

A verruca that has been given two treatments within a three-month period and has failed to respond completely, or has recurred, should not receive further irradiation.

MAURICE D. SACHS, M.D.

On Keloids and Their Treatment. Sverre Strand. *Acta radiol.* 26: 397-408, June 30, 1945.

A review of the more recent European literature on keloids and their irradiation treatment is given along with a discussion of the histogenesis and pathogenesis of this clinical entity.

The technic of treatment with radium at the Norwegian Radium Hospital is presented. A radium-mold with radium-skin distance of 0.7 cm. and filtration of 0.7 to 1.0 mm. platinum is used. The molds are adjusted to deliver about 560 r in twenty-four hours, and a total dosage of 1,400 to 2,000 r, extended over a period of three or four days, is delivered to the keloid site. The dosage is adjusted to the probable radiosensitivity of the individual keloid, age of the patient and of the keloid, its extent and elevation above the surrounding skin.

Of 117 cases treated during the years 1933-42, 57 per cent have shown very satisfactory regression, 32 per cent good regression, 6 per cent some regression, and 1 per cent no regression. The pain characteristic of some types of keloid disappeared in practically all cases. In no instance was there a tendency to recurrence after radium treatment had caused regression. Conditions for regression are most favorable in growths of less than one year duration and in younger patients.

VICTOR KREMENS, M.D.

NON-NEOPLASTIC DISEASE

Conductive Deafness and Its Relation to Lymphoid Hyperplasia of the Nasopharynx. Benefits from X-Ray Therapy. Edward B. D. Neuhauser and Charles F. Ferguson. *M. Clin. North America* 28: 1251-1258, September 1945.

Since 1939, 38 patients with conductive deafness have been treated by roentgen radiation at the Chil-

dren's Hospital, Boston, but only 16 have been adequately followed. In 2 instances the response was not satisfactory: one patient had nerve deafness, and treatment was advised only with a vague hope for improvement; the other was a psychoneurotic with complaints of deafness which could never be evaluated. The remaining 14 patients all showed some improvement, and in 12 the response was excellent.

After the diagnosis of conductive deafness due to hyperplastic lymphoid tissue in the nasopharynx has been established, a decision as to the use of surgery or radiation must be made. If there is considerable adenoid tissue, it is usually best to remove it surgically. If this has already been done and any secondary hypertrophic tissue is present in or about the eustachian orifices where curettage would be impossible or dangerous because of the possibility of producing stenosis of the orifices, radiation is advisable. It does not appear material whether radium, radon, or roentgen radiation is employed, so long as treatment is complete. The authors recommend roentgen rays because of the simplicity of treatment and its general availability.

When the roentgen treatment of hyperplastic lymphoid tissue was first begun at the Children's Hospital, there was considerable variation in the amount of radiation administered and in the number of treatments given. Now 800 r measured in air is considered sufficient to restore the patency of the eustachian orifices. It is customary to treat through two lateral ports sufficiently large to cover the nasopharynx; 6×8 cm. is usually adequate. At one sitting 200 r is given through each lateral port (200 kv., 10 ma., 50 cm. T.S.D., 1.0 mm. Al, and 0.5 Cu filtration, with a half-value layer of 1.05 mm. Cu). One week later a similar treatment is given and the patient is asked to return in six weeks for re-evaluation and a recording by the audiometer.

Roentgen Irradiation in the Treatment of Marie-Strümpell Disease (Ankylosing Spondylarthritis): Analysis of 160 Cases. James E. Hemphill and Robert J. Reeves. *Am. J. Roentgenol.* 54: 282-289, September 1945.

Marie-Strümpell disease is a chronic systemic disease of unknown etiology characterized by inflammatory changes in the synovial membrane and periarticular structures of the sacroiliac and spinal joints, with remissions and exacerbations of systemic and local manifestations. The disease appears to be a clinical entity. The blood sedimentation rate is always elevated and is a guide in follow-up. The disease characteristically begins in the sacroiliac joints and extends upward. Fibrous and bony ankylosis follow a gradual destruction of the joint cartilage. Most cases occur between the ages of twenty and forty-five. Pain and stiffness are early symptoms and are worse in the morning. Paravertebral muscle spasm is closely associated with the pain and stiffness.

Early in the disease the roentgenogram made obliquely at a 45-degree angle may show changes about the articular facets of the vertebrae. Usually the earliest detected changes are in the sacroiliac joints. Calcification of the ligaments, producing bridging of the intervertebral disks with ankylosis of the spine, occurs in the final stage of the disease.

The earlier correct diagnosis can be made and proper orthopedic and roentgen treatment instituted, the better the prognosis. The orthopedic treatment is most

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important, and satisfactory results cannot be expected if roentgen therapy is used alone. The authors' series numbers 160 cases; 86 per cent of the patients were males; 94 per cent were white. The roentgen therapy factors used were: 200 kv., 30 to 50 cm. distance, 0.5 mm. Cu plus 1.0 mm. Al, 8 to 25 ma. Elongated fields over the spinal column were treated, and the lateral spinal ligaments were included in the beam. A roughly triangular field was used over the lumbosacral and sacroiliac joints. A total dose of 450 r to 600 r (in air) per field was given, 150 r to each field daily or every other day. The series was repeated in six to eight weeks if necessary. In 78 per cent of those treated one series was given, in 17 per cent two series, and in 5 per cent three series. Seventy-six per cent of the patients were improved by the treatment. Thirteen patients who were bedridden and unable to work returned to gainful occupation. Seventy-two per cent of the treated patients showed a reduction of sedimentation rates after therapy. The main effects of roentgen therapy are reduction of pain, stiffness, and paravertebral muscle spasm. This allows orthopedic correction of the otherwise inevitable deformities, and the authors feel that this is one of the chief values of roentgen therapy.

The pathological granulations of Marie-Strümpell disease are similar to the vascular granulations of other inflammatory reactions known to be radiosensitive. Arrest of the production of the granulating pannus is not too much to hope for. This may be the mechanism of roentgen reaction. To accomplish this, the treatment must be instituted early.

CLARENCE E. WEAVER, M.D.

Pruritus Ani: A Clinical Study. Arthur L. Shapiro and Stephen Rothman. *Gastroenterology* 5: 155-168, September 1945.

A study of 70 patients with pruritus ani revealed none of the commonly listed etiologic factors. Neurodermatitis was present in 55.7 per cent of the patients, including those with perianal lichenification. Treatment based on elimination of the use of toilet paper and substitution of a superfatted soap sitz bath, with auxiliary use of phenobarbital, local application of ointments or lotions, and minimum doses of x-radiation was successful in 93 per cent of the 58 patients on whom a follow-up could be made.

Thirty-eight out of the 70 patients were given x-ray therapy. The rest did not receive this treatment, either because they had acute inflammatory signs, with the subsidence of which the pruritus disappeared, or because they had received previous irradiation. The authors believe that the only form of pruritus ani in which x-ray therapy is of decisive value and almost necessary for cutting through the vicious circle of itching and scratching is pruritus ani with lichenification. Even in this form, application of crude coal tar ointments can fairly well be substituted for x-rays.

The effect of the irradiation is not directly proportional to the quantity of x-rays given, and small doses of soft radiation are more beneficial than larger doses of more penetrating rays. In this series single doses of 41 to 82 r (corresponding to 1/8 to 1/4 of 1 skin unit) were given, at 80 kv.p., h.v.l. 0.05 mm. Cu, without filter. The field of exposure was smaller than 4 cm. in diameter and thus back-scatter could be ignored. This treatment was repeated after a two weeks' inter-

val, exceptionally after one week. The average total number of irradiations was three. In cases which responded well, no further irradiation was needed; in the others continuation of the treatment would have been useless.

Short Wave Radiations: Mechanism of the Anti-Inflammatory Effect. Lewis G. Jacobs. *California & West. Med.* 63: 127-130, September 1945.

It is the opinion of the author that theories attributing the beneficial action of x-rays in inflammatory lesions to the effect on the lymphocytes, the blood stream, or the infecting microorganisms do not offer a satisfactory explanation. He agrees with Borak that vascular effects play an important role. Recently that writer (*Radiology* 42: 249, 1944) pointed out that x-ray causes dilatation of the capillaries and constriction of the arterioles. This tends to decrease the inflammation by increasing the transudation of antibodies, leukocytes, and lymphocytes, and reduces the heat and swelling. In addition, small doses of radiation have a direct effect on the permeability of the cell membrane; there is increased cell streaming, which is thought to be due to liquefaction of protoplasm; cell metabolism is increased and a reversal of the albumin-globulin ratio is effected.

In order to treat inflammations successfully, it is advisable to use a dose of 50 to 100 r on alternate days (total dose not to exceed 300 r in acute cases and 600 r in chronic cases). Low voltage and light filtration are preferred, except in chronic lesions such as tuberculous adenitis, where an intermediate voltage (140 kv.p.) is better.

Irradiation therapy is effective against most inflammatory lesions and the results, in the hands of an experienced therapist, are good. Treatment must be individualized, however, the total dosage, kilovoltage, and filtration being suited to the case in hand.

MAURICE D. SACHS, M.D.

TECHNIC AND DOSAGE

Contact Radiotherapy: Dosimetry and Distribution of Radiation in the Tissues. Lucien Mallet. *J. de radiol. et d'électrol.* 26: 9-11, 1944-45.

All types of contact therapy apparatus follow essentially that of Chaoul, using a very long wave length, a filter of about 0.2 mm. nickel, and a kilovoltage of about 60. The average skin-target distance is about 3 mm. The Philips tube is described by the author. Here the distance is about 18 mm.; the tube is mobile and can be directed manually during treatment. The author made his own determinations as to safety of operation, from the standpoint of stray radiation, and determined that the manufacturer's claims are borne out in this respect. The homogeneity of radiation was also found to be as represented. The dose delivered at working distance would appear to be, after calculations have been corrected, about 7,250 r/m. The depth dose estimations are about as follows: at 5 mm., 40 per cent; at 1 cm., 20 per cent; at 2 cm., 7 per cent. Dosages with aluminum filters added are also given.

After the discussion of the physics involved, a number of case histories are appended, detailing treatment and results, which were considered very good in most well chosen cases of localized malignant skin lesions.

PERCY J. DELANO, M.D.

A Note on the Effect of Spraying "Contact" Therapy Applicators with Aluminium. W. J. Meredith. Brit. J. Radiol. 18: 297-298, September 1945.

The undesirable secondary radiation arising from a "contact" applicator may be removed by spraying it with aluminum and covering the tube window with an aluminum plate. A sprayed coating 1/100 inch thick and a filter 0.1 mm. thick on the window will cut down the scattered radiation approximately 85 per cent and the primary beam about 5 per cent.

SYDNEY J. HAWLEY, M.D.

Intensity Variations in the Field of Irradiation. Viggo E. Thayssen. Acta radiol. 26: 353-360, June 30, 1945. (In English.)

After a brief mention of the literature, the author gives several practical examples of how the intensities in a field of irradiation may be determined, and compares the obtained results with theoretical values.

Over a wooden frame, 25 X 25 cm., a washed roentgen film was stretched and upon this was traced a suitable system of dividing lines. Along these lines small condenser chambers (condiometer, external diameter 10 mm.) built on Sievert's principle, with a capacity of 7 r were distributed, so that the entire beam of the tube was mapped out. Back-scatter was avoided by placing the frame 50 cm. above the floor on an ordinary laboratory stand. The tubes used showed an even decrease in intensity toward the periphery of the field, with an increasing rate of decrease with greater distance from the middle. A composite curve was constructed from the isodose curves obtained with five different tubes. It was found that the periphery of the field gets roughly 50 per cent of the intensity in the center. At a distance of 8 cm. from the center of the field the decrease should theoretically be 5 per cent but was found to be 10 per cent. At a distance of 10 cm. the theoretical and actual figures are, respectively, 7 and 20 per cent.

A number of tubes which had seen considerable service produced isodoses which were found to deviate markedly from the normal. Photographs taken with a pin-hole camera showed the focus, in each case, to be asymmetric. These photographs, when compared with the corresponding isodose curves, give a good correlation of the asymmetric radiation.

The author suggests that, especially with old tubes, routine measurement of dose should be supplemented with photography with a pin-hole camera, and perhaps with measuring of the distribution of the intensity variations in a given field. VICTOR KREMENS, M.D.

Physical, Biochemical and Therapeutic Aspects of Volume Dose. Symposium. J. R. Clarkson, J. W. Boag, Barbara Holmes, and F. Ellis. Brit. J. Radiol. 18: 233-246, August 1945.

In introducing this symposium Clarkson points out that the total energy absorbed in the body during irradiation is a quantity of great clinical and physical importance. The unit of "integral dose" suggested by Mayneord in 1940 is the gram-roentgen, which is the energy conversion when 1 r is delivered to 1 gm. of air.

This is approximately 85 ergs. The megagram-roentgen (1,000,000 gram-roentgens) is approximately equivalent to 2 calories.

Experimental studies on a phantom constructed to resemble the human body show that the integral dose varies greatly with the quality of the radiation. This is significant in connection with questions of protection against stray radiation. A worker with high-voltage therapy equipment may receive five times as much energy for an equally measured stray radiation dose as one using diagnostic equipment.

Studies using a 6 X 15 cm. field, h.v.l. 3.7 mm. Cu, and 80 cm. focal skin distance, over the center of the trunk, show that about 30 per cent of the energy absorbed occurs in parts of the body receiving less than 10 per cent of the dose at the center of the field on the surface. It was also found that the energy absorbed was 50 per cent greater when a limiting diaphragm of 3.2 mm. of lead was used as compared with one of 11 mm. thickness. Not only was the dose "outside the beam" increased but the shape of the dose contours was modified by scatter from the outside.

Boag reports additional studies showing that the amount absorbed at 2 mm. and 4 mm. Cu h.v.l. depends primarily on the area and location of the fields, and to a less extent on the focal-skin distance, the size of the patient, and the half-value layer.

The biochemical aspects are discussed by Holmes, while Ellis takes up the correlation of biological effects with the volume dose. He concludes that the chief value of the volume dose at present is in evaluating principles of treatment and protection on physical grounds, rather than as a practical guide to biological effects. "The conception of volume dose as a means of enlarging our knowledge and understanding of the principles of radiotherapy has been of great value, and it provides a yardstick for measuring many future developments. In connection with individual patients it is less an aid to treatment at present than a means of collecting scientific knowledge, but when more is known of the effect of radiation I foresee an added usefulness in the scientific field which might possibly be translated into terms of everyday treatment."

Curves are given from which an estimation of the integral dose may be made with reasonable accuracy.

SYDNEY J. HAWLEY, M.D.

A Quantitative Analysis of the Effect of Gamma Radiation on Malignant Cells in Vitro and in Vivo. I. Lasnitzki. Brit. J. Radiol. 18: 214-220, July 1945.

For this study of the effect of gamma radiation on tumor cells, the material used was transplantable mouse adenocarcinoma 63. The dose in both *in vivo* and *in vitro* experiments was 198 r at a rate of 11 r per minute. The effect of the radiation was measured by counts of mitotic cells and degenerating cells. In both types of experiment the effect on inhibition of mitosis and on the occurrence of cell degeneration was qualitatively and quantitatively similar. The effect upon cells which were already in division was more marked *in vivo*, as was recovery from the effects of the irradiation.

SYDNEY J. HAWLEY, M.D.

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